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ABSTRACT

The booklet discusses and reports on a study of elicited imitation as a vehicle for assessing the language-functioning level of echolalic autistic children. An historical overview is presented of the diagnosis of early infantile autism. The question of whether or not early infantile autism is a distinct syndrome is addressed. The theoretical and empirical orientations to language behaviors of autistic children are delineated, and the existence of an autistic language is discussed. Studies in child language are reviewed, focusing on those in which elicited imitation is utilized to assess language functioning. The study itself investigated the possible semantic influences underlying the echolalic autistic S' imitative performance. Findings are discussed in terms of mean-length-of-utterance, context versus non-context, syntactic construction, semantic relations, and semantic-syntactic complexity. Among other things, the findings did not identify a language characteristic specific and unique to the so-called early infantile autism syndrome. (DLS)

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ELICITED IMITATION: A VEHICLE FOR ASSESSING THE LANGUAGE FUNCTIONING LEVEL OF ECHOLALIC AUTISTIC CHILDREN

Gudrun Fritsch

FINAL REPORT

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ELICITED IMITATION: A VEHICLE FOR ASSESSING THE LANGUAGE FUNCTIONING LEVEL OF ECHOLALIC AUTISTIC CHILDREN

Gudrun Fritsch

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Center for Innovation in Teaching the Handicapped

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CHAPTER 1

INTRODUCTION

Information about the linguistic systems of children who are labeled language disordered, but who nevertheless succeed in making linguistically significant generalizations, can add an important dimension to the knowledge accounting for the language development process. The use of language plays a crucial role in all aspects of human development: intellectual, social, educational and emotional. It is virtually impossible to overemphasize the importance of language to the developing child. The acquisition of language is still a subject of controversy among researchers in the field of linguistics, psycholinguistics and neurolinguistics. Different views are expressed according to the researcher's opinion and the work with which he is concerned.

Carroll (1967) defines language as the system that speakers have learned, including sounds, words, and grammatical patterns that they employ in speech communication. In the author's view, language is a system, a code, which underlies the actual manifestation of motor behavior which we call speech. The code or system as presented by Carroll is composed of four distinct aspects: (1) phonology -- the specification of the units of sound (phonemes) which go together to compose words and other forms in language; (2) morphology -- the listing of words and other basic meaningful forms (morphemes) of the language and the specification of the ways in which these forms may be modified when placed in varying contexts; (3) syntax -- the specification

of the patterns in which linguistic forms may be arranged and of the ways in which these patterns may be modified or transformed in varying contexts; (4) semantics -- the specification of the meanings of linguistic forms and syntactical patterns in relation to objects, events, processes, attributes, and relationships in human experience (Carroll, 1967. p. 211).

Lenneberg's (1967) conception of language implies the use of symbols which have a systematic relationship to each other so that the person is able to utter an infinite number of new messages. To those who have an adequate command of a language these messages should be understandable. Hence, language involves communication. The essence of language has been said to be the "capability of generating and understanding novel utterances" (McNeill, 1970).

Although language is usually expressed through speech, speech is merely one form of expressive language. And even speech does not necessarily involve language. There are children who have been taught words which they will speak, but if they do not understand what they say, and if they do not use the words spontaneously to communicate, then all they have mastered is an algorithm for repeating words.

Researchers in the field of psycholinguistics further suggest that children become compstent with language because the human brain has an "inbuilt capacity to extract rules from the speech heard as part of everyday experience" (Brown, 1965; Lenneberg, 1967; McNeill, 1966). These researchers believe that children learn their mother tongue but

that the rules are demonstrably not learned by a process of conditioning. They suggest that at each stage of development, the child extracts a different set of rules. Each stage is more complex than the previous one, but each is complete in itself and not just an incomplete version of the adult language. Eventually the stage is reached when the rules are the same as those adopted by the adults with whom the developing child is in contact. Each child seems to devise his own theories about the rules governing language on the basis of his own personal experiences.

For the last decade the emphasis in the field of linguistics and psycholinguistics has been on similarities and universals in child language development. Researchers assume that all children develop the language of their environment in the same manner. Some children may be faster in the acquisition process and some slower, but nevertheless, they go through the same sequence of language stages. That is an assumption which may be questionable.

Children developing language at a "normal rate" may use different strategies than children who are somewhat slower or those who are extremely slow. Recent child language studies (Nelson, 1973), working with normal children's first words (Bloom, Lightbown & Hood, 1975), and looking at the period of very early syntax, reveal some interesting facts regarding different strategies for acquiring language. Nelson (1973), for example, identifies two general approaches to language. She describes one as "referential" and characterizes it as learning to talk about things, an "object language." The second approach she

calls expressive". Expressive language is a social interaction language in which children learn to speak about themselves and others. Nelson's examples for expressive language include phrases like: "Stop it"; "Go away"; "Don't do it"; "Thank you"; "I want it" (Nelson, 1973, pp. 21-22). In a more recent paper, Nelson (1975) states that the expressive speakers "learned and used a large number of phrases and sentences early in the language acquisition period, while the ... referential did not--they could be described as progressing clearly from one-word to a two-word stage whereas the expressive speakers could not be so characterized" (p. 462). Both Nelson (1973) and Bloom et al., (1975) found that children acquiring language at a "normal rate" use the "referential" ("nominal") strategy. In their utterances "referential" speakers include more nouns and also describe the nouns in more detail. The children seem to concentrate their efforts on talking about objects.

Although neither Nelson nor Bloom claims that the two strategies are related to delayed or impaired acquisition, it appears important to ask such a question. It may be useful to investigate if language-delayed or language-disordered children differ with respect to using one strategy in preference to the other.

The noticeable trend in linguistic research has been almost exclusively directed toward studying "generative grammar" (Chomsky, 1965). Hence, the functional aspect of language behavior has been generally neglected. The recent research in neurolinguistics by Van Lancker (1975) is an exception to this trend. She has proposed a model for learning to talk which includes the major component of

"a functionally significant dimension describing language use called the propositional/automatic dimension" (p. 60). Furthermore, she has suggested that "automatic and propositional speech are not two disjunctive sets, but rather a continuum in speech abilities with vocal reflexes and animal communication at one end and cognitive, voluntary language at the other" (p. 273). Van Lancker concludes that "to adequately incorporate these features into a grammatical description, it is necessary to develop a new theoretical framework within which models of language behavior can be constructed" (p. 174).

In order to reveal the extent of the linguistic competence of language impaired children, investigations must be designed to include the comprehension and production of linguistic elements at the phonological, morphological, syntactic and semantic levels of language development. The present work focuses specifically on the semantic aspect of language development and attempts to incorporate this element appropriately into the linguistic system.

In recent years there has been much discussion in the literature regarding the language development in early infantile autism. The controversy ranges from the notion of extreme delayed language development to one of a somewhat deviant language development.

Research increasingly emphasizes central nervous system dysfunction which is specific to language and may preclude the development of communicative skills. But for the most part, references to the language behavior of autistic children are described in terms of syntactical structure, and the literature neglects the semantic aspect. Previous programming with autistic children has generally assumed that

the autistic child, whether mute or echolalic, has no meaningful language, although the echolalic child has a considerably better prognosis than the mute child. Virtually no description of echolalic autistic children's semantic characteristics are in the literature. The present research, therefore, focuses on the echolalic abilities of autistic children and utilizes elicited imitation in order to analyze semantic as well as grammatical complexity.

Since deviant language development is considered an important factor in the diagnosis and prognosis of autistic children, a reliable description of the specific nature of this deviance is essential for a complete understanding of the disorder. However, a description of the specific nature of the deviant processes involved in echolalic autistic children's language behavior is not yet available.

There is considerable confusion with regard to the use of the label "autism" and the nature of the syndrome. "Of all the syndromes now classified as developmental disabilities, 'autism' is one of the most difficult to understand. Wide differences in severity, periodic changes of the symptoms, confusing and inconsistent nosology, and the lack of specific physical signs make diagnosis a difficult procedure" (Ornitz & Ritvo, 1976, p. 7). The frequent complaint is that of delay in speech development.

Lotter reported that 4 or 5 children in every 10,000 in the general population exhibit a cluster of behavioral characteristics which can be grouped into six broad categories (Simmons & Tymchuk, 1973). These categories are consistent with the description of other authors (Creak,

1961, 1964; Kanner, 1943, 1946; Rimland, 1964; Rutter, 1968, 1972). These categories are:

1. Impairment of interpersonal relationships characterized by aloofness, decreased physical contact, and lack of eye contact.
2. Deficits in social behavior seen in severe limitations in cooperative play, toy play, and self-care skills.
3. Stereotyped activities including self-stimulatory behavior, various kinds of repetitions, and preoccupations with sameness.
4. Impairment of intellect manifested by concreteness of thought, school performance deficits, and difficulties with judgment and abstract thinking.
5. Disturbances in speech and language seen in various forms such as mutism, echolalic speech, delayed development, and a variety of other idiosyncrasies in word usage, speech modulation, and content.
6. Onset prior to the age of 30 months (Simmons & Tymchuk, 1973, pp. 665-673).

Additional nonlinguistic behavioral abnormalities associated with early infantile autism seem to clearly differentiate the syndrome from aphasia and elective mutism, and in contrast to partial deafness and blindness, environmental deprivation, Down's syndrome, and childhood schizophrenia, no known organic or inorganic reasons can account for these abnormalities (Ornitz & Ritvo, 1976). Unlike childhood schizophrenia, abnormal development in early infantile autism has been observed

prior to age 30 months. Retrospectively, it is noted from birth. The observation of the age of onset has been increasingly emphasized as a variable which should clearly differentiate early infantile autism from childhood schizophrenia. In spite of these differentiations, whether or not early infantile autism is a phenomenologically distinct syndrome is still a matter of controversy. Thus, early infantile autism has been selected for this study because it is considered an extreme form of developmental disorder in which "deviant language development" is the central aspect of the diagnosis. Virtually in all classification schemes, disturbances of speech and language are the primary criteria. For the most part, the references in the literature to the language behavior of autistic children are described in less precise, linguistic terms. A list of observed speech and language faults in autistic children is given by Goldfarb, Goldfarb, Braunstein, and Scholl (1972). These include categories of abnormal articulation and intonation ("sing-song" speech, a "wooden" or "flat" voice quality), semantic inappropriateness, and syntactic errors.

Kanner (1943) reported that these children tended to repeat, rather than construct, original remarks. Both immediate and delayed repetition are referred to as "echolalia" in the literature. The research attempted to address the question as to whether echolalic autistic children use language forms which are appropriate for younger normal children (quantitative differences) or whether echolalic autistic children use different linguistic forms in the language acquisition process (qualitative differences). The purpose of the present study was to investigate the role of echolalia. Echolalic speech patterns are observed in

approximately 50% of all autistic children. Those who do not exhibit this pattern remain mute (Hingtgen & Bryson, 1972). Furthermore, most autistic children who eventually exhibit spontaneous communicative language to any extent do so concurrent with or subsequent to a prior period of echolalic speech (Hingtgen & Bryson, 1972).

Role of Echolalia

In reviewing the available literature about language behavior in autistic children, the conclusion is drawn that the precise role of echolalia is not known. Although clinicians agree that the prognosis for eventual communicative speech is much greater for children who are echolalic, as opposed to those who are mute, most current linguistic theory and language therapy programs for these children have generally accepted the premise that echolalic language behavior is meaningless and worthless. The present research utilizes the existing linguistic behavior evidenced by echolalia in autistic children as a vehicle for assessing their current levels of language functioning. Since echolalia is a form of imitative behavior, it might be useful to relate it to the normal role that imitation plays in language acquisition.

Role of Elicited Imitation

Previous research has indicated that elicited imitation probably operates through the linguistic capacity of the child. In other words, what a child knows about the language of his environment can be revealed through the systematic use of elicited imitation of selected sentences which exceed short-term memory capacity. This is true for the normal language-developing child. But there is a lack of adequate information

about the echolalic autistic child being confronted with the similar task. This study provides data concerning the performance of echolalic autistic children on similar tasks.

Process of Elicited Imitation

The above information about normal language acquisition seems to indicate that elicited imitation is a useful research tool for efficiently studying early language development. Actually, very little is known about the processes involved in elicited imitative behavior of normal and autistic children. The present research investigates the behavioral processes and controls for external context.

Variable of Elicited Imitation

Furthermore, previous studies of elicited imitation in normal children as well as in echolalic autistic children have focused primarily on syntactic variables, with almost no information available on the effect of semantic relations on imitative performance. This study focuses on the semantic relations, but also provides data about the interaction effects of semantic and syntactical complexity on the children's ability to imitate.

The following research questions were studied:

1. Is there a differential effect of Mean Length of Utterance (MLU) on echolalic autistic children's ability to imitate?
2. Is there a differential effect of the presence or absence of external contextual manipulation on echolalic autistic children's ability to imitate?

3. Is there a differential effect of syntactic constructions on echolalic autistic children's ability to imitate?
4. Is there a differential effect of semantic relations on echolalic autistic children's ability to imitate?
5. Is there a semantic-syntactic interaction effect on echolalic autistic children's ability to imitate?

The empirical confirmation of the author's research questions might suggest the need for a shift in the perspective of autistic children's language behaviors and thereby contribute to a better understanding of the label of early infantile autism. The focus of the present work is not on the description of the linguistic rules which children "discover" given exposure to primary linguistic data as a result of innate knowledge of structural universals in language. Rather, the focus is on conceptual knowledge about the environment which children are seen as having to bring to the language learning task if that is to be successful. Children are described as having to use "meaning as a clue to language," especially in the early stages of language learning.

Chapter 2 presents an historical overview regarding the diagnosis of early infantile autism and attempts to answer the question: Is early infantile autism a distinct syndrome?

Chapter 3 delineates the theoretical and empirical orientations to language behaviors of autistic children, which lead into the question: Does an autistic language exist? In order to establish a basis for making a decision about the role of echolalia in autistic children, studies

in child language are reviewed, especially those in which elicited imitation is utilized to assess language functioning.

Chapter 4 presents the hypotheses. Chapter 5 describes the subjects and the methodology of the study. Chapter 6 presents the findings in the area of semantic-syntactic relations. Chapter 7 offers an interpretation of the findings, as well as a discussion of the implications for the field of special education and for related fields such as linguistics, psycholinguistics, child psychiatry and speech pathology, in regard to assessment and future language training. Chapter 7 also includes suggested directions for future research.

CHAPTER 2

HISTORICAL AND THEORETICAL PERSPECTIVES ON EARLY INFANTILE AUTISM

The following chapter is divided into two sections. The first presents the historical perspectives regarding the diagnosis of early infantile autism. It reflects the considerable controversy surrounding the label "infantile autism" as a distinct nosological syndrome. The second section focuses on theoretical orientations to the characteristics in early infantile autism.

Historical Perspectives

In the early 1940 s Kanner (1943) and Asperger (1944) independently published a description of a group of children who exhibited an inborn disturbance of affective contact. Both clinicians had almost the same background--Kanner originally from Austria, Asperger a leading clinician in Austria today--and used the term "autistic" in order to describe the inability of these children to relate to their surroundings. Failure to differentiate the term from that originally referred to by Bleuler (1911) precipitated a definitional confusion which persists in current professional lexicons. Initially, "autism" was used by Bleuler (1911) in his monograph on schizophrenia in order to describe the quality of introverted, self-centered ideation in schizophrenic patients. Bleuler's description of the term "autism" related to adolescent schizophrenia (see Zinkin, 1950 for English translation). His concept of autism appears to have influenced both Kanner and Asperger. According to Bleuler;

(S)chizophrenia is characterized by a very peculiar alteration of the relation between the patient's inner life and the external world. The inner life assumes pathological predominance (autism). The most severe schizophrenics, who have no more contact with the outside world, live in a world of their own. They have encased themselves with their desires and wishes (which they consider fulfilled) or occupy themselves with the trials and tribulations of their persecutory ideas; they have cut themselves off as much as possible from any contact with the external world. This detachment from reality, together with the relative and absolute predominance of the inner life, we term autism. Autism nearly coincides with what Freud has termed autoerotism. Since, however, for this author the concepts of libido and erotism are so much broader than for other schools of thought, his term cannot very well be used here without giving rise to many misunderstandings. In essence the term, autism, designates in a positive way the same concept that P. Janet formulated negatively as "the loss of the sense of reality." However, we cannot accept Janet's term without discussion because he understands this symptom in a far too general sense. The sense of reality is not entirely lacking in the schizophrenic. It fails only in relation to matters threatening to contradict his complexes (p. 63).

In less severe cases, the affective and logical significance of reality is only somewhat damaged. The patients are still able to move about in the external world but neither evidence nor logic have any influence on their hopes and delusions. Everything which is in contradiction to their complexes simply does not exist for their thinking or feeling (p. 64).

Autism is not always detected at the very first glance. Initially the behavior of many patients betrays nothing remarkable. It is only on prolonged observation that one sees how much they always seek their own way, and how very little they permit their environment to influence them.

Autism is also manifested by many patients externally. (Naturally, this is, as a rule, unintentional.) Not only do they not concern themselves with anything around them, but they sit around with faces constantly averted, looking at a blank wall; or they shut off their sensory portals by drawing a skirt or bed clothes over their heads (p. 65).

The autistic world has as much reality for the patient as the true one, but his is a different kind of reality. Frequently, they cannot keep the two kinds of reality separated from each other even though they can make the distinction in principle. The reality of the autistic world

> may also seem more valid than that of reality itself; the patients then hold their fantasy world for the real, reality for an illusion. They no longer believe in the evidence of their own senses (p. 66).
>
> Wishes and fears constitute the contents of autistic thinking. In those rare cases where the contradictions to reality are not felt at all, it is the wishes alone which are involved; fears appear when the patient senses the obstacles to the fulfillment of his wishes. Even where no true delusions arise autism is demonstrable in the patients' inability to cope with reality, in their inappropriate reactions to outside influences (irritability), and in their lack of resistance to every and any idea and urge. In the same way as autistic feeling is detached from reality, autistic thinking obeys its own special laws. To be sure, autistic thinking makes use of the customary logical connections insofar as they are suitable but it is in no way bound to such logical laws. Autistic thinking is directed by affective needs; the patient thinks in symbols, in analogies, in fragmentary concepts, in accidental connections (p. 67).

By using the term "autism" as did Bleuler, Kanner (1943) described eleven cases of psychiatrically disturbed children which he considered to be specific pathognomonic syndrome. He advanced the opinion that what he named "early infantile autism" is a clear, distinct nosological entity. Thus, he contended that the condition should be classified within the broad framework of schizophrenia, but <u>different</u> from the usual forms of childhood psychosis and schizophrenia. He stated:

> The combination of extreme autism, obsessiveness, stereotype and echolalia brings the total picture into relationship with some of the basic schizophrenia phenomena. Some of the children have indeed been diagnosed as of this type at one time or another, but in spite of the remarkable similarities, the condition differs in many respects from all other known instances of childhood schizophrenia (p. 217).

Kanner has also worked out diagnostic criteria which he felt should be used as a definitive guide in any clinical diagnosis of this type of condition:

(1) There is from the very beginning of life an extreme autistic aloneness; the child does not respond to anything that comes to him from the outside world.

(2) The child has an obsessive desire for the maintenance of sameness.

(3) There is the failure to use language for the purpose of communication, this includes echolalia and the reversal of pronouns.

(4) The child has a fascination with objects.

(5) The child fails to assume an anticipatory posture when being picked up.

(6) The child has good cognitive potential, but is poor in abstract thinking.

(7) There is an abnormal response to sensory stimuli.

(8) There are abnormal mannerisms and movements.

(9) The child shows skills in fine motor development.

(10) Parents are highly intelligent and appear emotionally cold and obsessive.

Asperger (1944) also described a group of abnormal psychopathic children, whom he called "autistic childhood psychopaths". However, his symptoms describe a different syndrome from Kanner's. According to Van Krevelen (1971) Table 1 lists the major distinguishing features between the two descriptions.

Table 1

A Comparison of Distinguishing Features Between

Autism and Autistic Psychopathy

Early Infantile Autism (Kanner)	Autistic Psychopathy (Asperger)
1. Manifestation age: first month of life.	1. Manifestation age: third year of life or later.
2. Child walks earlier than he speaks; speech is retarded or absent.	2. Child walks late, speaks earlier.
3. Language does not attain the function of communication.	3. Language aims at communication but remains "one-way traffic".
4. Eye contact: other people do not exist.	4. Eye contact: other people are evaded.
5. The child lives in a world of his own.	5. The child lives in our world in his own way.
6. Social prognosis is poor.	6. Social prognosis is rather good.
7. A psychotic process.	7. A personality trait.

The above short preliminary historical sketch exemplifies the considerable confusion and controversy resulting from the use of the label "autistic".

The misunderstanding of the concept autism may be due to the fact that Bleuler's valuable monograph remained untranslated from the original text for a long time (Zinkin, 1950). Most of the research in early infantile autism has been dependent on quotations, digests and second-hand expositions. A detailed, critical analysis of the post-Bleuler psychological literature on this topic is very important and desperately needed in order to find a shared, common starting point for the present state of the problem.

Theoretical Perspectives

Early Infantile Autism

The current world-wide recognition of the syndrome of early infantile autism is the subject of many new scientific efforts. In reviewing the literature, one is tempted to conclude that each researcher has interpreted the label in a different sense and with a different meaning. The definitions of early infantile autism encompass various interpretations: early infantile autism as a type of childhood schizophrenia; infantile psychosis; psychogenic disturbance and autistic development due to faulty conditioning; symbiotic psychosis; brain damage syndrome; mental retardation; biological disorder; perceptual dysfunction; and central nervous system dysfunction.

Early Infantile Autism as a Type of Childhood Schizophrenia

Kanner (1943) contended that early infantile autism should be classified within the broad framework of schizophrenia; consequently, the syndrome is considered an early manifestation of schizophrenia.

In 1959, Bender claimed that autism is not a clinical or etiological entity, but she placed it at one end of a continuum of schizophrenia which extends from childhood into adulthood. In Britain in 1961, a working committee on this topic published a progress report which attempted to clarify and describe the "schizophrenic syndrome in childhood" (Creak, 1961).

According to Rutter (1968) there are immense differences between early infantile autism and adult schizophrenia. Table 2 demonstrates the distinguishing features of autism and childhood schizophrenia as delineated by Rutter (1968, p. 72). Rutter (1968; 1972) suggests that autism and childhood schizophrenia are two distinct syndromes that should be carefully distinguished from each other. In spite of these differences, Bender's concept of a continuum of schizophrenia still remains in the literature because Rutter's claim has not been substantiated.

Early Infantile Autism as a Condition of Early Infantile Psychosis

Placing early infantile autism within the group of childhood psychoses, as did Kanner in 1944, Rutter (1968) suggests that, according to age of onset, the childhood psychoses can be differentiated into three distinct groups. One group experiences infantile psychosis at about age 3, 4, or 5. The child develops normally up to a generally unknown illness or environmental stress situation which causes the severe disruption. In some cases this might be due to encephalitis or even overt brain damage. These incidences result in a degeneration of

Table 2

A Comparison of the Distinguishing Features Between Autism and Childhood Schizophrenia

Autism	Contradictory Results	Childhood Schizophrenia
1. Disorder is present more in males (Rutter, 1967a).		1. Equally present in both sexes (Rutter, 1968).
2. Parents are of above average intelligence and of superior socioeconomic status (Lotter, 1967).	2. This is not supported by recent research (Ornitz & Ritvo, 1976).	2. Social background is the same as that of the general population (Rutter, 1968).
3. Adult schizophrenia has relatively rare incidence in ancestry (Rutter, 1967a, 1972).		3. Relatively common in the immediate families (Rutter, 1968, 1972).
4. Mental subnormality is a common accompaniment (Rutter, 1968).		4. Less frequently associated (Rutter, 1968).
5. The characteristic pattern of IQ sub-test scores, high on visuo-spatial tasks and low on verbal tasks (Rutter, 1966a).		5. The characteristic pattern of IQ sub-test scores is not reported in the available literature.
6. Delusions and hallucinations are quite rare, even after they reach adolescence and early adult life (Rutter, 1966b).	6. This is not a general consensus, There are reports of typically autistic children who, as adults, exhibit clinical signs of schizophrenia and of some adult schizophrenics	6. Prevalent (Rutter, 1968).

A Comparison of the Distinguishing Features Between Autism and Childhood Schizophrenia

Autism	Contradictory Results	Childhood Schizophrenia
	whose histories indicate they were typically autistic when pre-schoolers (Ornitz & Ritvo, 1976).	
7. Marked remissions and relapses are decidedly uncommon, a steady course is much more usual (Rutter, et al., 1967).		7. These remissions and relapses are very often recognized (Rutter, 1968).
8. Disorder is present from early infancy (Rutter, 1972).		8. Appears normal from 2 years of age. Mean onset is puberal not infant (Kugelmaas, 1970).
9. Children are usually healthy and well-formed, beautiful. Delayed maturation (Kugelmaas, 1970).		9. Fish (1957-1959) used symptoms such as light, transulcent skin, receding chin, small face, fetus-like appearance to identify infants with schizophrenia.
10. EEG usually normal (Ayre, 1974).	10. Seizures frequently co-exist. Two EEGs with sleep tracings are required to evaluate this possibility. Seizure disorders are more likely to clinically manifest in autistic children as they become older (Ornitz & Ritvo, 1976).	10. Abnormal EEG in most cases.

A Comparison of the Distinguishing Features Between Autism and Childhood Schizophrenia

Autism	Contradictory Results	Childhood Schizophrenia
11. Characteristic language patterns, including affirmation by repetition, pronominal reversal, delayed echolalia (Ayre, 1974).		11. These language characteristics are not observed.

the brain and these developments are very similar to early infantile autism so that the differential diagnosis is very difficult -- if not impossible (Rutter, 1968).

The other group is the late onset psychosis, becoming manifest between the ages of 5 and 15 years. The relatively small third group of psychoses becomes apparent before the age of 3 years. In Table 3 the differentiating features are listed. The only controversial evidence in the table substantiates the contension that there are two separate syndromes.

Early Infantile Autism as a Psychogenic Disturbance

By far the most outspoken proponent of the psychogenic interpretation of autism is Bettelheim (1967), who assumes that the infant is physically normal at birth and attributes the development of emotionally disturbed behavior to pathological personality characteristics of the parents. Bettelheim (1967) states:

> The precipitating factor in infantile autism is the parents' wish that the child should not exist ... while the same wish may not cause the same disturbance in other children, and while at some future time we may learn that some organic factor is a precondition of autism, the fact is that almost all organic conditions that have so far been linked to this disease are also present in nonautistic children (p. 125).

This view is in accord with Kanner's (1973) in which he sees the mother of the autistic child as a "refrigerator" mother, and further states:

> Autistic children come from intelligent, sophisticated stock, ... the vast majority of parents are cold, detached, humorless perfectionists, more at home in the realm of abstractions than

Table 3

A Comparison of the Distinguishing Features Between Autism and Early Infantile Psychosis

Autism	Contradictory Results	Early Infantile Psychosis
1. Onset very early in infancy, occasionally as late as second or rarely third year of life (Rutter, 1968)	1. Onset is retrospectively noted at birth.	1. Onset during years of age 3, 4, or 5 (Rutter, 1968).
2. Particular patterns of development (Rutter, 1968).		2. Normal development up to the severe dismuption (Rutter, 1968).
3. According to several epidemiological surveys (Rutter, 1967; Treffert, 1970; Wing, 1967), a male/female sex ratio approximately 4:1 has been documented.		3. Equally present in both sexes (Rutter, 1968).
4. Abnormal relationships with other children (Rutter, 1968),		4. Relationships not as severely deviant as in autistic children (Rutter, 1968).
5. Retarded language development (Rutter, 1968). In several cases lack of response to sounds in early childhood, as if deaf (Rutter, 1968).		5. Normal language development until the disorder causing incidence occurs (Rutter, 1968).

A Comparison of the Distinguishing Features Between Autism and Early Infantile Psychosis

Autism	Contradictory Results	Early Infantile Psychosis
6. Two types of mannerisms or stereotypes: hand and finger mannerisms and complex whole body movements (Rutter, 1968).		6. A variety of mannerisms and stereotypes (Rutter, 1968).
7. Self-injury (wrist-biting or head-banging) (Rutter, 1968).		7. Relative rare incidence of self-mutilation (Rutter, 1968).

> in the world of people. ... They treat their children about as meticulously and impersonally as they treat their automobiles (p. 74).

From a different philosophical point of view, but still in the same realm, the behavioral psychologists have added another hypothesis in reference to the cause of autism: the environmentally determined disturbance. The maladjustment in the behavior of autistic children is the result of differential reinforcement; that is, autism is due to faulty learning, and the autistic child has simply been improperly conditioned by his parents (Lovaas, 1966). This view is based on the response of some autistic children to the operant conditioning training method. However, to imply a causal relationship based on the success of a particular therapy is presumptuous and warrants substantiation. In Table 4 the differentiating features between autism and a psychogenic disturbance are summarized.

The balance of evidence seems to be that decisive findings exist, but research into etiology is still necessary to determine two clinically different syndromes.

Early Infantile Autism as a Symbiotic Psychosis

Mahler (1952), another important proponent in the psychoanalytic camp, regards early infantile autism as a "symbiotic psychosis" due to a breakdown of relations between mother and infant. The most striking feature of the children is the absence of any demand of human and social contact. In her theory, autism in early infancy is a normal condition, designated as "primary autism". She uses this term to describe the

Table 4

A Comparison of the Distinguishing Features Between Autism and Psychogenic Disturbance

Autism	Contradictory Results	Psychogenic Disturbance
1. The disorder appears very early in the infant, prior to 30 months (Rutter, 1968).	1. Retrospectively noted at birth (Rutter, 1972).	1. Disturbance develops during the critical periods, the first 6 months, at 6-9months, or at 18-24 months (Bettelheim, 1967).
2. Parental characteristics: detached, highly organized and meticulous in behavior, high intelligence and high social status (Rutter, 1968).	2. The specific parental characteristics are not supported by recent research. In addition, the concept of unconscious parental hostility and rejection do not apply to the parents of autistic children (Ornitz & Ritvo, 1976). A higher social class distribution has not been confirmed (Ornitz & Ritvo, 1976).	2. Parental rejection, extreme negative feelings shown by the parents. Child develops behavior analogous to the behavior exhibited by inmates of concentration camps in Nazi Germany (Bettelheim, 1967).
3. Siblings usually do not show pathological abnormalities (Rutter, 1968).	3. Specific parental behavior causing this severe disturbance has not been confirmed (Ornitz & Ritvo, 1976).	3. The particular kind of abnormality in the parental behavior is directed only toward one child in the family Meyers & Goldfarb, 1961; Rank, 1949).

A Comparison of the Distinguishing Features Between Autism and Psychogenic Disturbance

Autism	Contradictory Results	Psychogenic Disturbance
4. Difficulties in using communicative language (Rutter, 1968).		4. Evidence of impaired communicative language (Bettelheim, 1967).

development from unawareness of the outside world to awareness of the outside world and other people. This awareness occurs when sufficient capacity for differentiation has developed. Parental nurture facilitates the condition of development. But if this nurture is grossly lacking, the child remains in the state of early infantile autism (Table 5).

No research results could be found that contradict Mahler's theory. Rutter comments that Mahler's concept is still in general usage, although its nosological status remains rather uncertain. Mahler's theory represents a very important contribution in the psychoanalytic school of thought. The theory constitutes a developmental disorder, with the primary disturbance in object relations and the ego boundaries, which very much coincides with Piaget's (1947) theory regarding affective development in children.

Early Infantile Autism as a Condition of Brain Damage

The differential diagnosis of the brain damage syndrome or early infantile autism is by no means clear-cut. They evidence tremendous overlapping in symptoms. In some cases, brain lesions may be responsible for the development of early infantile autism (Rutter, 1968). Conversely, Rutter argues against the term "brain damage" because it includes a wide variety of disturbances. Two important questions raised by Rutter were; Why are the vast majority of children with brain damage not autistic? and, Why are the minority of brain-damaged children autistic? In the absence of satisfactory answers, Rutter suggests that brain damage cannot be considered a major etiological factor in autism. In Table 6 an attempt is made to summarize the arguments.

Table 5

A Comparison of the Distinguishing Features Between Autism and Symbiotic Psychosis

Autism	Contradictory Results	Symbiotic Psychosis
1. No evidence of a pathological mother-child relationship (Ornitz & Ritvo, 1976).		1. Disorder occurs because of the breakdown between the relations of mother and child (Mahler, 1952).
2. Not all autistic children exhibit self-injury behaviors but they are common.		2. The child shows autoaggressive behaviors such as head-banging, self-biting, and other self-hurting mutilating activities to compensate for a "deranged libido economy, constituting a pathological attempt to feel alive and whole" (Mahler, 1952).
3. Impaired communication.		3. Impaired communication is also observed.

Table 6

A Comparison of the Distinguishing Features Between Autism and Brain Damage Syndrome

Autism	Contradictory Results	Brain Damage Syndrome
1. At least half the cases of autism have no evidence of brain damage (Rutter, 1968).	1. Autism and seizures frequently coexist, and it has been demonstrated that two EEGs with sleep tracings are required to evaluate this possibility (Ornitz & Ritvo, 1976).	1. It is not a homogeneous pathological process. It is a remarkably heterogeneous process and differs from one affected child to another (Kolvin, 1971).
2. Overt neurological signs become clinically manifest when the children become older. In a well-followed series of autistic children, 25% first developed seizures between 11 and 19 years of age. Most of these children had normal EEGs and neurological examinations earlier in life (Rutter, 1971).	2. The tools to measure brain function are still very inadequate (Rutter, 1968).	2. Neurological signs are usually found in associations with nonautistic conditions.
3. A high proportion of the low IQ children experience epileptic seizures in		3. IQ differences are very well recognized in different brain damage syndromes.

A Comparison of the Distinguishing Feautres Between Autism and Brain Damage Syndrome

Autism	Contradictory Results	Brain Damage Syndrome
adolescence in contrast to a low incidence of epilepsy in autistic children of normal intelligence		
4. Retarded language development.		4. Language development is significantly impaired.

Early Infantile Autism as a Type of Mental Retardation

Kanner's claim that all autistic children are basically of normal intelligence has not been supported by recent research. On the contrary, autistic children are generally described as functioning at severely subnormal intellectual levels.

In a study by Lotter (1966), testing intelligence in 32 8-to-10-year-old autistic children, over half (68.8%) of these children obtained IQ's below 55, 15.6% between 55 and 79, and 15.6% scored above 80. These findings are in accordance with other research such as the Kolvin study (1971), in which 78% of the autistic children surveyed had IQ's under 70 or were untestable. The important question which arises is whether or not autism is most appropriately seen as another variety of mental retardation. But authors like Rutter (1968, 1974), Hermelin and O'Connor (1976), and Frith (1969) claim that autism can be differentiated from mental retardation. Rutter reports that the findings on intelligence testing alone are insufficient to account for autism. In addition, he emphasizes that the IQs of autistic children proved to be highly stable and remarkably good predictors of prognosis. However, the IQ functions in the same way as it does for both normal and other subnormal populations. The IQ interpretation is not particularly specific to autism and, therefore, autism cannot be regarded as merely another variety of mental subnormality (Rutter, 1968) (Table 7).

From the evidence cited, Rutter (1968) concludes that mental subnormality as a concept is insufficient to account for autism. Later on

Table 7

A Comparison of the Distinguishing Features Between Autism and Mental Retardation

Autism	Contradictory Results	Mental Retardation
1. On standard IQ tests, between a quarter and a third of these children display an IQ which is "unquestionably" in the normal range (Rutter & Lockyer, 1967).	1. Accumulating clinical evidence indicates that two-thirds to three-fourths of all autistic patients will perform throughout life at retarded levels. Therefore, mental retardation and autism can clearly coexist (Ornitz & Ritvo, 1976).	1. Normal range of performance on IQ tests is not a finding in research with the mentally retarded population.
2. The characteristic pattern of IQ sub-test scores: high on visuo-spatial tasks (block design and object assembly sub-tests of the Wechsler scales), and low on verbal tasks or those which required abstract thought or logic (Rutter, 1968).	2. Clinical experience with autistics and follow-up studies demonstrate that low scores on developmental tests or reports of "untestability" during the early years are associated with retarded intellectual functioning later in life. Most autistic individuals cannot perform many IQ test items. The notion that autistics have a primary	2. Specific pattern of IQ sub-test scores are not characteristic features in test reports, of mentally retarded population. Usually, the scores in all sub-tests on the Wechsler scales are low.

A Comparison of the Distinguishing Features Between Autism and Mental Retardation

Autism	Contradictory Results	Mental Retardation
	affective deficiency that interferes with the expression of their assumed normal or superior intellectual and cognitive potentials has given way to the recognition that their intellectual deficiencies are very much as real as those of patients with primary retardation (Ornitz & Ritvo, 1976).	
3. The behavioral characteristics of all children with low IQ are generally similar to those of high IQ (Rutter & Lockyer, 1967).	3. Higher IQ children are more responsive to their environment, while lower IQ children exhibit more severe behaviors such as self-injury, object-smelling and hand and finger stereotypies (Rutter, 1974).	3. These features are not as common in the mentally retarded population.
4. Development is disrupted, e.g., autistic child may learn to sit up at a normal age, but be very late in standing; or he may stand	4. The normal physical development in mentally retarded population, only at a slower rate, is mostly assumed. Very detailed parent reports	4. Development proceeds more slowly but with the same eveness observed in normal children.

A Comparison of the Distinguishing Features Between Autism and Mental Retardation

Autism	Contradictory Results	Mental Retardation
at the same age as normal children, but be abnormally long in taking his first steps without support. The autistic child's physical development is best characterized as "sequences of spurts and plateaus" (Ornitz & Ritvo, 1976).	of retarded children are rare when compared with parent reports of autistic children. In addition, mentally retarded children are mostly not apt to appear for special medical or educational help until they reach school age. Therefore, much less is known about the development course prior to school age of these children than is known about autistic children.	
5. The pattern of IQ scores found in autistic children are strongly related to the child's level of language development. The child's poor level of intellectual attainment is related to specific defects in language (Rutter, 1968).	5. Retarded children's intellectual performance is also highly correlated with their level of language functioning. The limitations in abstraction, symbol formation and abstract play are directly influenced by their language functioning.	5. The poor level of intellectual attainment is due to global deficiency of intellect (Rutter, 1968).

Rutter et al. (1971), Hermelin and O'Connor (1976), and Frith (1969) claim that autistic children can be differentiated from mentally retarded children by their greater deficits in a variety of language and language-related functions. The authors' conclusion is derived from the documented cognitive differences between the two groups. All of these authors hypothesize that the specific cognitive deficit is the cause of the social and behavioral differences noted in autistic children. These findings demonstrate that mental retardation in autism should be viewed as characteristic rather than the cause of the syndrome.

In spite of all the above cited authors' conclusions, the controversy that autism is a separate clinical syndrome still remains and will remain because greater precision in differentiating the two syndromes is necessary. Contradictory research (Ornitz & Ritvo, 1976) defies the contention of a definitive syndrome and its separation from other entities such as mental retardation and organic brain damage.

Early Infantile Autism as a Result of a Biochemical Disorder

A report was made that untreated PKU children were exhibiting behavioral patterns similar to autistic children (Guthrie & Wyatt, 1975). This fact prompted speculations of an analog etiology of autism. Therefore, some investigations have been carried out to determine the possibility if biochemical abnormalities cause autism. Unfortunately, the work in the field of biochemistry in reference to autism is difficult to interpret because of the extreme lack of clinical data and the lack of replication of the experiments by other researchers. Important variables, like diet, hospitalization, stress and medication, are

virtually impossible to control. But these variables can be responsible for biochemical changes and result in different findings (Guthrie & Wyatt, 1975). Table 8 summarizes the research findings and attempts to show the hard or soft evidence for the etiology of the syndrome of infantile autism.

Early Infantile Autism as a Result of Perceptual Dysfunction

In the 1960's a shift evolved in the research of early infantile autism. Because of the inconclusive research results, clinicians began to deemphasize and even reject the psychogenic explanation for autism. Instead, they focused on evidence of a perceptual dysfunction.

Most characteristics in autistic children which have been mentioned thus far differ from child to child. But the presence of impaired language development seems to be in agreement with all the hypotheses. In fact, virtually all classification schemes reported in the literature emphasize the language dysfunction as a necessary criterion for the diagnosis, and several hypotheses based on perceptual and cognitive dysfunction appeared which can be grouped into three categories (Tanguay, 1976, p. 77):

1. Theory of perceptual inconstancy;
2. Theory of a defect in cross-modal associations;
3. Theory of a central cognitive defect.

The major proponents of the theory of perceptual inconstancy (Ornitz & Ritvo, 1968, 1969, 1973, 1974) postulate that autistic children suffer from a defect in the operation of homeostatic brain stem reflexes which affects the regulation of sensory input and output.

Table 8

A Comparison of the Distinguishing Features Between Autism and Biochemical Disorder

Autism	Contradictory Results	Biochemical Disorder
1. Possible abnormalities in the biogenic amines such as serotonin (Ritvo et al., 1970).	1. Yuwiler, Geller & Ritvo (1976) were unable to explain these results on the basis of differences between autistic and non-autistic children in circadian rhythmicity for either whole blood serotonin or platelets (Ornitz & Ritvo, 1976).	1. In 1961 Schain and Freedman reported 25% of a group of 23 institutionalized patients, diagnosed as autistic, had elevated blood serotonin (Ornitz & Ritvo, 1976). Ritvo, et al. (1971) found a significantly higher amount of whole blood serotonin in 5 autistic children 36 - 47 months of age than in 7 age matched normal children but no significant difference between older autistics and their age-matched controls (Ornitz & Ritvo, 1976).
2. Boullin et al. (1970) reported an increased efflux of serotonin from the platelets of patients diagnosed as autistic.	2. Yuwiler et al. (1976) were unable to replicate the findings in spite of carefully matched subjects and the use of similar and improved methods (Ornitz & Ritvo, 1976).	2. Ritvo et al. (1971) also noted that platelet counts decreased in normal children aged 2 - 8 years and increased in autistic children through that age range. But these differences did not reach statistical significance (Ornitz & Ritvo, 1976).

A Comparison of the Distinguishing Features Between Autism and Biochemical Disorder

Autism	Contradictory Results	Biochemical Disorder
3. Metabolic abnormality (Rimland, 1971, 1978).	3. No confirming results are available.	3. Rimland (1971) postulated a vitamin deficiency in autistic children causing an atypical metabolism. In 1978, in a double-blind study, Rimland revealed the finding that if B_6 supplement was replaced with a placebo, the behavior significantly deteriorated during the B_6 withdrawl.

Supportive evidence for the theory of defect in cross-modal associations has been reported by the experiments of Lovaas et al. (1971) and Bryson (1970) which show that autistic children have great difficulty in responding in a different modality from that in which stimulus is presented.

The third theory, proposed to explain the etiology of early infantile autism, is based on autistic children's inability to comprehend and to use "meaningful" and "communicative" language. Rutter et al. (1971) has emphasized that the syndrome of early infantile autism may result from an as yet unidentified central cognitive deficit which is specific to language and which prevents development of "meaningful" language. Based on this hypothesis psychological investigations by Hermelin and O'Connor (1967, 1976), Hermelin (1972) and Frith (1969, 1970) were carried out. Their findings have shown that autistic children have great difficulties with encoding or decoding in the auditory and visual mode, but to a lesser extent in the visual mode.

If the specific language deficit is associated with the autistic syndrome and is considered the causal process of the condition, some specific pattern to the language functioning of autistic children should be evident. But systematic investigations about "autistic language" are not yet available in the literature.

Furthermore, the cited hypothesis raises the important questions about the adequate understanding of language. How do we best consider language: As biological correlates in the central nervous system? As one isolated particular area of the brain? As an interaction of biological and environmental factors? These questions are still unanswered.

In Table 9 the important research about various language dysfunctions are summarized. Table 9 also attempts to show the problems involved in the formulation of a hypothesis regarding perceptual dysfunction as a causal factor in early infantile autism.

Early Infantile Autism as a Result of a Central Nervous System (CNS) Dysfunction

In trying to understand what specific defects or dysfunctions underlie the syndrome of early infantile autism, recent research has increasingly focused on the cortical higher speech areas and their connections in the brain. Ornitz and Ritvo (1976) emphasize the significance of the disturbances of response to sensory stimuli, disturbances of developmental rate or sequence, and the disturbances of speech and language. From this evidence it may be argued that early infantile autism may result from an as yet unidentified CNS dysfunction. Based on clinical observations, the authors specifically suggest that autistic children suffer from a defect in the operation of homeostatic brain stem reflexes which affect the regulation of sensory input and output (1968, 1969. 1973, 1974). The authors further claim that autism is a clinically and behaviorally defined specific syndrome and divide the behavioral symptoms into five categories: (1) disturbances of perception, (2) disturbances of developmental rate, (3) disturbances of relating, (4) disturbances of speech and language, and (5) disturbances of motility (Ornitz & Ritvo, 1976, p. 9).

Table 9

A Comparison of Distinguishing Features Between Autism and Perceptual Dysfunction

Autism	Contradictory Results	Perceptual Dysfunction
1. Simmons & Tymchuk (1973): Language and speech disturbances are displayed in various forms. Creak et al. (1964): Speech has been lost, or never acquired, or many children have failed to develop speech beyond a level which is appropriate to an earlier stage. Lovaas (1977): In all these children language deficiency is a salient feature.	1. It is not clear if the studies refer to autistic, schizophrenic or other unspecified behavioral disorders. Language deficits in autism have been almost always described in impressionistic and gross linguistic terms of psychiatric status (Baltaxe & Simmons, 1975).	1. Language disorder is the primary abnormality (Rutter, 1968, 1971, 1974).
2. It seems that these children are unable to accurately modulate sensory input (Goldfarb, 1963). There is no startle response to sudden loud noise (Ornitz & Ritvo, 1976).	2. This profound disability alternates in the same child (Ornitz & Ritvo, 1976). In a hyporeactive state the child does not react to sounds, but in a hyperreactive state, the child is highly sensitive to these same stimuli (Ornitz & Ritvo, 1976).	2. Subjects' profound lack of response to sounds caused them to be thought deaf (Rutter, 1968, 1971).

A Comparison of Distinguishing Features Between Autism and Perceptual Dysfunction

Autism	Contradictory Results	Perceptual Dysfunction
3. Kanner (1946): On rare occasions mutism may be interrupted by the utterance of a whole sentence (mostly in emergency situations); the literalness which cannot accept synonyms or different connotations of the same proposition; the echolalia-type repetition of whole phrases, and the typical, almost pathognomonic, pronominal reversals which consist of the child's reference to himself as "you" and to the person spoken to as "I"; seemingly irrelevant nonsensical utterances are metaphorical expressions.	3. Despert (1946) states in a discussion about Kanner's work: "Extreme overlapping similarities with schizophrenic children and the early phenomena which were in the nature of a disturbed integration of language-sign and language-function. This was particularly true of the schizophrenic children with insidious onset. This group, incidentally, is the one presenting the greatest similarities with the children described by Kanner as autistic.	3. Mutism or the tendency to echo, reverse pronouns, particularly a confusion of "you" and "I" (Rutter, 1968).
4. Failure to understand the meaning of spoken words. Poor performance in the use of gestures and the transfer from one sensory modality to another (Tubbs, 1966).	4. Investigations of specific aspects of language behaviors fail to reflect an adequate understanding of "language" itself.	4. Hermelin and O'Connor (1976), Frith (1969) examined coding and immediate recall in autistics and controls: autistic children do not use concepts in memorizing; they remember the last part of a message regardless of whether or not it makes sense.

A Comparison of Distinguishing Features Between Autism and Perceptual Dysfunction

Autism	Contradictory Results	Perceptual Dysfunction
		Goldfarb et al. (1956) state: these children do not seem to reinforce their language output by facial or body gestures. Even when present, the gestures seem inappropriate to the linguisitc context.
5. Language is the most important prognostic and diagnostic factor (Rutter, 1968). Eisenberg (1956) reported that autistic children who did not demonstrate "useful speech" by age five would evidence gross retardation and disturbed behavior in adolescence.	5. Although abnormalities of language behavior rank high in making a clinical diagnosis, only one investigation has related language behavior more directly to clinical status (Wolff & Chess, 1965). Results showed that the number of different words and average length of utterances thus produced, correlated highly with the clinical assessment of the severity of the illness (Wolff & Chess, 1965).	5. Rutter (1968) stated that the autistic children who are not speaking by the age five may improve considerably, but they are unlikely to achieve a normal or near-normal level of social adjustment by adolescence.

One of the initial observations in regard to the diagnosis of autism is the missing startle response to sudden loud noise, so that the children have been thought to be deaf (Rutter, 1968). The profound lack of response to sounds has been described by Ornitz and Ritvo (1976) to result in hypo- or hyperreactive states which alternate in the same child. In a hyporeactive state the child does not react to sounds, either verbal or nonverbal, while in a hyperreactive state, the same child is highly sensitive to the same sounds. For example, the child does not respond to a loud noise behind him but turns around at a dripping water tap. The disturbances of developmental rates or sequences are best described as "sequences of spurts and plateaus" (Ornitz & Ritvo, 1976), meaning that an autistic child may learn to sit at a normal age, but it may be extremely late in standing up, or walking. Another extreme is observed, in which the child does not try to walk until 2 years of age but suddenly walks without any preliminary crawling or assistance.

Disturbed relating behavior is described in mothers' reports. The afflicted baby does not lift up its arms in anticipation of being picked up and does not adapt its posture to its mother's (Kanner, 1943; Wing, 1966). The mothers complain that their babies are not cuddly. They do not point to things in the room that they want or are interested in, and they appear to be happiest when left alone. The children tend to look past or through people, and they pay more attention to things that move or glitter than to human beings. Kanner's early case histories (1943), which are very well described, led him to conclude

that these children are suffering from an "inborn autistic disturbance of affective contact" (p. 247).

The children's general difficulties in understanding their surroundings give rise to several problems but the most striking one is their inability to understand and to use language. The children are very delayed in talking and some even remain mute. Those who do talk start by imitating exactly what other people say (echolalia), often the intonation and accent of the person who first said the words is copied exactly. When they develop meaningful words or phrases of their own, these are usually less fluent, lack inflection and do not convey any emotion (Ornitz & Ritvo, 1976; Wing, 1966). The "reversal of pronouns" is a common feature and the tendency to be extremely literal and concrete in their use or understanding of speech leave the listener confused unless he knows the circumstances which have led to the incident. The third chapter will describe the language disabilities of autistic children in greater detail.

In excellent and accurate parent reports the disturbances of motility are described in various patterns. The most typical disturbances include jumping, spinning, walking on tiptoe, twisting and turning their entire bodies, hands, and legs, and flapping their hands and fingers near their eyes. Drawing parallels to other visual or auditory handicaps, such as congenital partial deafness and partial blindness, the motility patterns of autistic children may be interpreted as seeking for sensations to make up for the lack of understandable visual and auditory impressions. The relation between motility and

perceptual disturbances led to further studies (Ornitz, Forsythe & de la Pena, 1973, 1974) which concluded that the motility disturbances in autistic children can be best understood as expressive of a CNS dysfunction (Ornitz & Ritvo, 1976).

The essential features for the diagnosis of autism as a result of a CNS dysfunction are summarized in Table 10 and cited from the research by Ornitz and Ritvo (1976). They include the essential features stated by Kanner (1943, 1973).

Of all the hypotheses concerning the etiology of early infantile autism, the explanation of a CNS dysfunction may lead to a more precise diagnostic label. Ornitz and Ritvo (1976) claim that autism is a clinically and behaviorally defined specific syndrome; however, it is not at all substantiated. As the previous comparisons and contrasts have shown, the use of the term "autism" in connection with children suffering from an as yet unidentified CNS dysfunction may be inappropriate. It is not only a syntactical matter--changing the adjective "autistic disturbance of affective contact" to a noun, "the syndrome of autism" (Ornitz & Ritvo, 1976)--and it is not only a semantic problem. Rather, it is a pragmatic problem which has led to confusions for more than 30 years and misconceptions which will remain, unless the noun "autism" is completely eliminated.

Whereas the hypothesis of CNS dysfunction does not account for the specific characteristics due to autism ("detachment from reality, together with relative and absolute predominance of inner life," Bleuler, 1911), the specific behavioral characteristics may be caused by the CNS

Table 10

A Comparison of Distinguishing Features Between Autism and CNS Dysfunction

Autism	CNS Dysfunction
Kanner (1943, 1973)	Ornitz & Ritvo (1976)
1. The children differ from schizophrenic patients, but should be classified within the broad framework of schizophrenia.	1. Autism is a clinically and behaviorally defined specific syndrome.
2. From the very beginning of life there is an extreme autistic aloneness, the child does not respond to anything that comes to him from the outside world.	2. It is manifested at birth or shortly thereafter and remains throughout the lifetime of the patient.
	3. Its symptoms are expressive of an underlying neuropathophysiological process which affects developmental rate, the modulation of perception (sensorimotor integration), language, cognitive and intellectual development, and the ability to relate.
4. One fact stands out prominent. In the whole group, there are very few really warm-hearted fathers and mothers. For the most part, the parents, the grandparents, and the collaterals are persons strongly preoccupied with abstractions of a scientific, literary, or artistic nature, and limited in genuine interest in people. Even some of the happiest marriages are rather cold and formal affairs. The question arises whether or to what extent this fact has contributed to the condition of the children.	

A Comparison of Distinguishing Features Between Autism and CNS Dysfunction

Autism	CNS Dysfunction
5. Kanner's diagnostic criteria: From the very beginning of life an external autistic aloneness persists. Obsessive desire for maintenance of sameness is present. There is failure to use language for the purpose of communication, fascination with objects, failure to assume an anticipatory posture when being picked up, good cognitive potential, but poor abstract thinking.	5. To establish the diagnosis patients must demonstrate, before the age of thirty-six months, specific disturbances of developmental rate, perception, relatedness and language. Many, but not all, patients demonstrate typical mobility disturbances.
	6. Autism occurs on an idiopathic basis or in conjunction with other diseases which affect the CNS.
7. The children come from highly intelligent parents. Families belong to middle-class, profession and high-income groups.	7. It afflicts children in all parts of the world, of all racial and ethnic backgrounds, and is found in families with the normally expected distributions of intelligence, social class, and personality factors.
	8. No etiologically based rational treatment is available which alters the course of the disease.
	9. Complete medical and neurological evaluations are essential to establish the diagnosis and should be repeated at yearly intervals. Particular attention should be paid to the likelihood that seizure disorders may appear in individual patients as they grow older.

A Comparison of Distinguishing Features Between Autism and CNS Dysfunction

Autism	CNS Dysfunction
	10. Supportive and symptomatic therapeutic measures (e.g., behavior therapy, special education, and residential treatment) are helpful in most cases. These should be monitored by a physician in charge and administered by specialists and parents trained in these modalities. Periodic reevaluations and updating of supportive therapeutic programs are necessary to keep abreast of the clinical changes that can be expected to occur in the majority of cases.
11. Subjects have good cognitive potential, but are poor in abstract thinking.	11. The long-term prognosis, unfortunately, is guarded. Approximately two-thirds of all patients manifest intellectual and cognitive deficits severe enough that they remain classified as retarded throughout their lives.
	12. Further basic research into neuropathophysiological processes underlying the syndrome is necessary if we are to develop a rational treatment program, the ultimate goal of our efforts.

dysfunction. According to Bleuler, the patient's autistic world has as much reality as the true one. The specific problem is the patient's inability to differentiate between idea and perception. The differentiating problem in autistic thinking is not the same phenomenon as in children who suffer from a CNS dysfunction from the beginning of their lives. Bleuler's definition of autism does not imply the severe cognitive deficit which led Kanner (1943) in his original conclusions to believe that the afflicted children's cognitive abilities were basically normal or even above average. However, recent research has shown that these children do suffer from a cognitive deficit. According to Bleuler (1911);

> Autistic thinking obeys the laws of logic only as far as it suits the purpose, but it is certainly not bound by them. The patient is controlled by affective needs. He also thinks in symbols, in analogies, in complete concepts, in random connections. If the patient turns to reality under certain circumstances, he is very well capable of thinking clearly and logically (p. 67).

Furthermore, in 1919 Bleuler stated that the term "autism" is not strictly reserved for psychotic, pathological autism but is extended and generalized to include variants of non-pathological behavior in which introversion predominating over contact with other people and their world is noticeable.

Kretschmer (1942) addressed the concept of autism and related the concept to the development in the area of temperament. Autism is a main characteristic for the development of temperament. He calls autism "a schizoid symptom of temperament" which varies from individual

to individual and which depends on the psychasthetic proportion of the individual.

Summary and Conclusions

The following overview provides a summary of the theoretical positions regarding the diagnosis of Early Infantile "Autism" reviewed in this chapter. It is a general survey of the essential features used as components of the "autistic" syndrome which are overlapping or even identical with other clinically defined disorders. The absence of entries in cells for specific criteria does not necessarily mean that research has proven the absence of the criteria, but rather that research has not dealt with these criteria.

In summarizing the different theories of the syndrome of early infantile autism, the question is raised: Does a distinct syndrome exist? The present author submits that children suffering from an as yet unidentified CNS dysfunction labeled "autism" may be best understood when considered along a continuum of developmental language disabilities, such as the various aphasias and severe mental retardation, and differentiated by relative severity and age of onset of these conditions. In future sections of the present work the term "autism" or "autistic" children is set in quotation marks to remind the reader that the term is considered as one characteristic within a cluster of developmental language disabilities.

Supported by the notion of a perceptual defect in "autistic" children, the hypothesis of CNS dysfunction has evoked an assumption

Table 11

Overview of Essential Features in the Diagnosis of Early Infantile "Autism"

and Other Clinically Defined Disorders

Essential Features	Autism	Child Schiz.	Infantile Psychosis	Psycho-genic D.	Symbiotic Psych.	Brain Damage	MR	Bioch. Dis.	Percep. Dys.	CNS Dys.	Research
Age of Onset Manifestation at birth	X				X	X	X	X	X	X	Kanner, 1943 Ornitz & Ritvo, 1976
prior 30 mths	X			X					X	X	Rutter, 1968 Rimland, 1964
after 30 mths		X	X								Bender, 1956 Kolvin, 1971
Disturbances of developmental rates											DeMeyer, 1975 DeMeyer et al. 1971 Rutter, 1965, 1974 Ornitz et al. 1969, 1973, 1974
uneven development	X					X			X	X	
arrested development			X				X	X			Rutter, 1965, 1974 Wing, 1966
Disturbance of responses to sensory stimuli											Goldfarb, 1963,1972 Schopler, 1965 Tangnay, 1976
perceptual inconstancy	X					X		X	X	X	
defective in cross-modal association	X					X	X	X	X		Weber, 1970 <G> Bryson, 1970 Lovaas et al. 1971
central cognitive defect	X					X	X	X	X	X	Hermelin, 1972 1976
Disturbance of Speech and Language	X	X	X	X	X	X	X	X	X	X	Baltaxe & Simmons, 1975, 1976 Bosch, 1970 Kanner, 1946, 1951

Echolalia	X	X		X		X	X		X	X	Fay, 1967, 1969, 1973, 1975 Pronovost et al., 1966
Mutism	X			X		X	X		X	X	Shapiro, 1970, 1974
Autistic aloneness											Creak, 1961, 1963, 1964 Kanner, 1943, 1951, 1973
Lack of eye contact	X	X		X	X	X	X		X	X	
Anticipatory posture	X				X				X	X	Kanner & Eisenberg, 1956 Rutter, 1965, 1971
Self-injury behav.	X			X	X	X	X		X	X	Ricks & Wing, 1975 Wing, 1974
EEG Abnormality		X	X			X	X	X			Ornitz & Ritvo, 197 Rutter, 1968, 1971
Onset of seizure increases with age	X								X	X	Hermelin & O'Connor 1970
Absence of EEG abnormality	X			X	X				X		Kanner, 1943 Rimland, 1964
Distinct patterns of IQ Tests WISC	X	X							X		Hermelin, 1968, 197 Rutter, 1971, 1974
Parental Personality											Asperger, 1944 〈G〉 Rimland, 1964
higher socio-econ.	X								X		Rutter, 1968
above average intelligence	X								X		Knobloch, 1961, 1962
parental hostility				X							Bettelheim, 1967
maternal deprivation					X						Mahler, 1952, 1972 〈G〉
Uneven sex ratio											Rimland, 1964, 1971
higher male ratio	X			X			X		X		Rutter, 1968
equal ratio		X	X			X					Wing, 1966

〈G〉 = German

in recent research which may result in a very strong negative implication for the prognosis of "autistic" children. CNS dysfunction is assumed specific to language and may preclude the acquisition of communicative language in "autistic" children. Although the hypothesis of CNS dysfunction is highly speculative and needs "basic research evidence", to use Ornitz and Ritvo's words, the assumption of severe impairment of communicative language competence in "autistic" children remains.

Closely related to the above claim is the fascinating and thoroughly investigated issue of the dominance of one hemisphere in regard to language in the human brain. In the area of brain research the question of the locus of speech and language in the brain has been discussed for over a century. Two schools of thought exist in regard to this topic. One, the "locationist's" view, claims that language and speech functions can be identified with structural areas in the brain (Geschwind, 1970) while the "holistic" view emphasizes the interaction of all parts of the brain (Lenneberg, 1967, 1975).

According to Lenneberg (1975) the present state of knowledge about the neurobiological correlates of language is very limited. Current evidence about specific brain structures and the localization of language function in the brain is exclusively based on pathological research of human language (Lenneberg, 1975). The researcher emphasizes that the destruction of tissue in the brain provides a major source to assume the language functions in the brain, but direct investigations of CNS and verbal behavior has not yet been possible. EEG data on

cortical electrical activities linked with verbal behavior has been inconclusive. He further cautioned that "the notion of fixed narrowly located brain centers for specific behavior must also go" (p. 12). He concludes that at this point in time it would be wise to consider language as a function of much more widely distributed networks with considerable connectivity (Lenneberg, 1975, p. 12).

Lenneberg (1967) also demonstrated that, until the age of two years, a near equipotentiality functionally exists between both hemispheres. Bay (1975) even postulated that the age at which the hemispheres of the brain definitely cease to be equipotent for language is not clearly evident and could be as late as age 10 in some cases. This research finding coincides with Rutter's (1968) observation that some "autistic" children acquired language as late as 11 or 12 years of age, and it also explains the observation that children recover more quickly and more completely from extensive brain damage. It would appear that localization of language function must be less rigid at younger ages. Consequently, only bilateral brain damage severely impairs the acquisition of language and intellectual development of young children (Bay, 1975).

Relating Bay's research findings to the syndrome of early infantile "autism" which is manifested at birth or shortly thereafter, the impaired language development of these children could not be the result of a unilateral damage (hypothesis of a left-hemispheric damage by Hermelin & O'Connor, 1973); rather it must involve a gross bilateral damage.

However, at the present time, too little is known of the functions of many structurally distinct areas of the CNS in order to determine all the structures that constitute innate bases for language acquisition and function. Clinical research specifically suggests that innate predispositions toward language specialization within each hemisphere exist, but at the same time, evidence is considerable for flexibility during the early years of childhood.

Van Lancker (1975) reiterates the hypothesis of heterogenous cerebral processing of language, and takes it a step forward in suggesting heterogenity in language, which means that language is comprised of heterogeneous subsets and is heterogeneously processed in the brain (p. 58). She claims that qualitative differences exist between lateralized and non-lateralized processing language and distinguishes between different language modes such as "propositional" (creative language use) and "automatic" language (overlearned language use). The implication of this claim in regard to "autistic" children's language behavior will be discussed in the next chapter.

CHAPTER 3

THEORETICAL AND EMPIRICAL ORIENTATIONS TO THE LANGUAGE CHARACTERISTICS OF AUTISTIC CHILDREN

Having reviewed the literature related to the different hypotheses concerning the diagnosis of early infantile "autism", in the previous chapter, this chapter deals with the linguistic research in regard to children labeled "autistic". In order to evaluate the assumption of deviant language development in "autistic" children, both nonlinguistic and linguistic features in "autistic" children's language behavior are reviewed. In addition, the relationship between the echolalic phenomenon and normal language development--with particular focus on studies dealing with elicited imitation--is addressed.

Language Development in Early Infantile "Autism"

Since Kanner's description of the syndrome (1943; 1946), "autism" has continued to be characterized by the presence of deviant language development. This deviant language development ranges from little or no vocalization and mutism, to echolalia, and abnormal voice quality in those children who attain some degree of communicative language.

According to Kanner (1946) and many other researchers (Creak, 1961, 1964; Rimland, 1964; Rutter, 1968, 1972; Simmons & Tymchuk, 1973), the language characteristics of "autistic" children can be summarized by the following features:

Mutism, which occasionally may be interrupted by repetition of a whole sentence (generally in emergency situations).

Literalness, in which one cannot accept synonyms or different connotations of the same proposition. An example of an "autistic" boy who was heard to say: "Don't throw the dog off the balcony", a recurrent phrase always repeated in full length in absence of both dog and balcony. This sentence, however, meant something to the child. Whenever he was tempted to throw anything, he would use this sentence to admonish and check himself (Kanner, 1946).

Echolalia, which is a repetition of entire phrases.

Pronominal Reversals, which consist of the child's reference to himself as "you" and the person spoken to as "I".

Metaphorical substitutions, the use of fragments of speech and portmanteau expressions to convey meaning. An example cited from Wing (1974) is "Roomabeans", meaning that the child was asking to take his baked beans and toast to another room to be eaten.

Simple verbal negation, which is used as a "magic" protection against unpleasant occurrences.

If these language characteristics could be considered as exclusive patterns unique to the syndrome of infantile "autism", a precise description of an "autistic language" would be in existence. Instead, these characteristics are clearly evident in other developmental language disorders. Consequently, the immediate question arises: Does a unique "autistic language" exist? How does it differ qualitatively and quantitatively from other developmental language disorders? The search for the answer to these questions has been the focus of many studies (Baltaxe & Simmons, 1975; Bartak & Rutter, 1974; Bartolucci & Albers, 1974;

Cunningham & Dixon, 1961, 1966; Goldfarb et al., 1972; Hermelin, 1968; O'Connor, 1975; Pronovost, Walkstein, & Walkstein, 1966; Ricks, 1972; Shervanian, 1959; Wing, 1969).

In reviewing the literature regarding deviant language behavior in early infantile "autism" several problems become apparent:

(1) Most investigations are of a clinical research nature. These can be considered as interpretations in gross and less precise linguistic terms.

(2) Most investigations do not incorporate current linguistic and psycholinguistic theories. They can be considered as attempts to structurally analyze the language deficient behaviors of "autistic" children. They do not determine anything about the underlying linguistic competence of these children, nor do they indicate that possible linguistic structures may be actually used by these children.

(3) Most investigations do not appropriately relate the results to normal language acquisition.

(4) Most investigations eschew clear specification of the population involved. The situation has created considerable confusion in regard to the diagnosis of early infantile "autism".

(5) Most investigations do not clearly specify the intention of the study, because structural analysis and cognitive processes are seen as mutually exclusive.

(6) Most investigations do not identify specific language characteristics which could be termed "autistic".

Prelinguistic Characteristics in Early Infantile "Autism"

Nonverbal communication is much in evidence before the end of the first year of a child's development. It may be difficult to determine just when in the early weeks vocalizations become "goal-directed", but by about 9 months the normal baby is clearly using his voice to attract attention, express emotion, and to engage in social exchanges with familiar results. Unfortunately, there is little or no systematic observations of babies who later show the "autistic" pattern. The only evidence of behavior in the first year of life that could be found is anecdotal and retrospective (Wing, 1974). Mothers of "autistic" children report that they felt there was something wrong almost from birth, but a firm diagnosis is rarely made before the end of the second year. This fact is problematic, since details of the prelinguistic development of these children would be most valuable.

There is only one study which investigated prelinguistic vocalization. Ricks (1972) found that the "autistic" children differed from normal children and subnormal children in their prelinguistic behavior. He compared the vocal behavior of 8 "autistic" children between 3 years and 5 years 11 months and three children aged 5 to 8 years who were retarded but not "autistic," and a group of younger normal infants 8-12 months of age. Using tape-recorded vocalizations and using the parents to identify the sounds, he graded differences in cries of these three groups. Parents of the "autistic" children could identify their own child and could interpret the meaning of the message. They could even distinguish and identify meanings for "nonautistic" but retarded child

who they said "sounded normal", and for the normal child. However, they could not understand the meanings of the vocalizations by the other "autistic" children. Ricks' data showed that "autistic" children did not appear to use a "vocabulary of intonated signals" to express different emotional states or needs as did the other two groups. In addition, the "autistic" children could be distinguished from the two groups by the distinctiveness of their cries. Although Ricks' study is very important, it presents a problem because of the different age ranges between the 3 groups. It is impossible to say whether "autistic" children have normal, intoned, expressive sounds as babies but develop idiosyncratic, articulated methods of expression at a later stage.

Some support to the Ricks' data is noted by Bartak, Rutter, and Cox (1975). In a comparative study, retrospective parental reports indicated that "autistic" children exhibited either deficient or deviant babbling. Both studies compared the vocalization of children of vastly different chronological ages. According to Lieberman (1975) gross anatomical differences exist between the oral cavities of an infant and the older child; therefore, the vocalization has to be different in nature in infants and older children.

Another important factor in connection with the above study would be the question of maternal role in interaction with the child. The important maternal role in normal acquisition processes has been carefully analyzed by Brown and Bellugi (1964). Knowing that it has been frequently proposed by several authors (Bettelheim, 1967; Goldfarb, 1961; Mahler, 1952) that the absence of adequate interaction or a "frigid parent-

child relationship" may be the underlying cause of childhood "autism", it would be tremendously valuable to study mother-child verbal interaction. To date only one study (Goldfarb et al., 1966) relates the language patterns of schizophrenic children to those of their mothers and compares them to the language patterns of normal children with their mothers. But this study has been heavily criticized in the literature for its poor experimental design and espcially for the failure to match mothers in age, education, IQ and social class (Klein & Pollack, 1966). The authors' general conclusion was that the mothers of schizophrenic children provided poorer linguistic models than the mothers of normal children. From a linguistic and psycholinguistic point of view, the above study should have been analyzed in terms of specific correlations between syntactical constructions used by the mothers and those of the children.

Differences in the social behaviors of mothers may have been an important variable affecting results in a study like Ricks (1972).

Linguistic Characteristics in Early Infantile "Autism"

Previous sections of this work have discussed the hypothesis of deviant language development as the etiological process of early infantile "autism". This section reviews empirical evidence in an attempt to isolate the specific linguistic characteristics which are indicative for the underlying pathology. The review considers investigations organized into four areas of language: phonology, morphology, syntax, and semantics.

Phonological investigations. In reviewing the literature of phonological deficits in "autistic" children, one is led to the conclusion that there are rare systematic investigations of speech sound development in

"autistic" children. In the descriptive studies of schizophrenic children, Goldfarb et al. (1972) report general difficulties in the mechanics of speech sound production. More specifically, the authors note that in comparison with normal children, faults occur in "virtually every aspect of voice and speech, including volume, pitch, voice quality, rate, phrasing, fluency, stress, intonation and inflection, and articulation." On the other hand, the authors emphasize that there is not a single pattern of errors attributable to the atypical sample, other than excessive variability. Schizophrenic children show more errors at the extremes on each dimension. They are more likely to either speak too loudly, or to speak too softly.

Pronovost et al. (1966) support the presence of abnormalities in speech sound production in their sample of 14 "autistic" children ranging from 5 to 15 years of age. The authors emphasize a preference among "autistic" children for the use of high frequency sounds, as well as a tendency toward nasalization. For the group (6) which had begun to talk, the presence of the stop consonants; the nasals /m/ and /n/; and the glides /w/ and /y/ is reported, while the liquids /r/ and /l/; the fricatives; the affricatives; the nasal /n/; and the glide /h/ are missing. The general conclusion is that "autistic" children are slow but otherwise follow a normal speech developmental sequence with regard to phonology.

By differentiating the groups into a nonspeech and a speech group, Pronovost et al. make an important observation. The existing differences in the two groups are dependent on the mastery of fine motor control of the tongue, the lips, and the pharyngeal musculature, and coordination of activities is dependent on control of the breath stream.

Shervanian (1959) reports on the speech sound production of eight precommunicative psychotic children and finds large individual differences in the use of specific vowel and consonant sounds. Without clearly defining "psychotic," he concludes that the children are extremely delayed, but otherwise following the normal speech sound development.

In supporting the notion of delayed rather than deviant phonological acquisition, Voeltz (1976) emphasizes the rule-governed behavior shown in the speech of eight echolalic "autistic" children. Her results indicate that phonological restructuring takes place and is dependent on the developmental level and functioning of the individual child. She also emphasizes that the number of difficulties exhibited by the children is primarily due to the airstream mechanisms and to the state of the glottis, and argues that "autism per se may thus not be responsible for these aberrant language symptoms".

In another work, Pierce (1977) investigated the phonological production of 10 verbal "autistic" children. Her work also indicated that in general, "autistic" children show normal but delayed speech sound development. However, specific areas of atypical phonological development were also found. In this systematic study of speech sound production and perception, the "autistic" children were compared with 10 mentally retarded and 10 normal children. The results confirm a delay in phonological acquisition among the "autistic" population. It reveals, as well, a relative uniformity of error types in both speech production and perception in all three groups. The author emphasized that the "autistic" children differed significantly from the mentally retarded

in their level of mastery of the class of liquids. This finding is interpreted as being a manifestation of a more general deficit in the representational system of "autistic" children. The "autistic" children are also characterized by a significant inverse correlation between frequency of phonological production and perception errors, and both mental age and overall level of linguistic development. This is interpreted as further evidence for the global nature of the linguistic deficit in early infantile "autism".

In summary, the above results may indicate the importance of a widespread symptomatic diversity in speech sound acquisition rather than a mutually exclusive pattern of speech behavior which could be termed "autistic".

Morphological investigations. Investigations reporting differences in the occurrence of aspects of inflectional morphology in "autistic" children are difficult to find in the literature. Studies are not available which consider the use of inflections by "autistic" children in relation to the normal hierarchy of acquisition for these features.

In one longitudinal language development study of a six-year-old boy diagnosed as "autistic" over a 5-year period, Cunningham and Dixon (1961) and Cunningham (1966) reported an increase of utterance length by using some inflections. But there was little improvement after the initial progress.

This study is limited to gross linguistic characteristics and relies heavily on word counts. The authors emphasize the boy's use of nouns rather than pronouns without considering the normal early child

utterances. Bloom's (1970) analysis of one- and two-word utterances represent a new point of view of child grammar. In the holophrastic stage, a noun does not reflect a particular lexical item; rather it represents some ideas expressed by the child. Context and intonation have to be analyzed in order to determine what the child intended to communicate.

In the study by Bartolucci and Albers (1974), the researchers compared the usage of past tense marker in the language of "autistic" children, mentally retarded children and normal children. The results showed significant differences. The conclusion was drawn that the "autistic" children were not only delayed, but also deviant. The deviance was shown in the form of reduced usage of past tense marker. Again, this study does not relate the occurrence of inflections to the normal developmental sequence of these features.

In summarizing the above research findings, it seems apparent that they do not present morphological evidence to help understand the claim of deviant language behavior unique to the syndrome of early infantile "autism".

Syntactic investigations. On the topic of syntax, Kanner (1943) observed that "autistic" children have a tendency to reverse pronouns--e.g. the child immediately repeats the question "you want a cookie?" instead of "I want a cookie"--partially due to the repetition referred to as "echolalia" in the literature. Echolalia can occur in a variety of verbal expressions which are considered inappropriate, without communicative intent, and as deviant (Rutter, 1974). The echolalic behavior is evident in three different forms:

Immediate echolalia -- repetition occurs immediately after a verbal stimulus.

Delayed echolalia -- repetition occurs after a verbal stimulus but is removed from it in time. As reported, it can occur as long as days, weeks, or even months later.

Mitigated echolalia -- repetition occurs after verbal stimulus but in an altered form. This important observation was made by Fay (1967, 1969), who reported that "autistic" children alter some aspects of the original verbal stimulus in their repetitions.

These repetitions account for the frequent inversion of the first and second person singular personal pronouns. The child hears himself referred to as "you" and, because of not comprehending the shifting nature of the "I-you" pronoun referents, inverts the personal singular pronouns.

Other authors addressed themselves to the pronominal reversal. Bosch (1962) reported that "autistic" children selectively avoid the use of "I", and Bettelheim (1967) took this observation even further. He stated that "autistic" children, because of their disturbed ego development, will never echo "I" although they will echo other personal pronouns. Bartak and Rutter (1974) pursued Bettelheim's claim and reported different findings. If the position of the pronoun in the sentence is controlled for, the "autistic" children do echo "I" as often as they echo any other personal pronoun. Since "I" generally occurs in the sentence-initial position and "you" occurs in the latter part of the sentence, "you" is usually echoed more frequently.

The problem with the Bartak and Rutter (1974) study can be seen in the differences in age range (6-8 to 9-12 years) and the nonverbal IQ

range (IQ 40-100). The authors fail to report whether or not the chronologically younger children and/or the lower IQ children tended to inverse the first and second person singular personal pronouns. The results may have been very much influenced by the developmental and functional level of the children.

Pronovost et al. (1966) also commented on the syntactic aspects of verbal "autistic" children's language behavior. The authors concluded that their verbal subjects did not progress beyond the level of normal two- to three-year-old children, meaning that echolalic "autistic" children use concrete nouns in phrase structures or use nouns alone to name or label. In this study there was no evidence of using abstract or collective nouns. The authors mentioned also the presence of "agrammatism" and "paragrammatism" similar to those observed in the speech of aphasics without explaining this observation in details or giving examples. But the importance of the Pronovost study is that the data supported the argument that echolalia, instead of being meaningless and deviant, is used in a mitigated and selective fashion to convey meaning.

Additional syntactic investigation was attempted by Churchill (1972). He reported that in one of two cases of childhood "autism" language training had been tried in which the prepositions "in", "on", and "beside" had been taught in relation to a given set of objects. The child learned to perform appropriately; however, when new objects were introduced he could no longer apply the same relational concepts to the new set of items.

On the basis of the above studies one realizes that the results of these investigations support the hypothesis of a cognitive language

dysfunction in "autistic" children. It is difficult to decide whether syntactic development in "autism" is best characterized as extremely delayed but otherwise not unlike normal development, or whether it proceeds along a course of development specific to the syndrome itself.

In reviewing the available literature on language behavior in "autistic" children it is evident that researchers are caught in the "innate" controversy. Some current theorists of language acquisition (Chomsky, 1965, 1966; Lenneberg, 1967; McNeill, 1966) hypothesize an innate capacity for abstracting syntactic rules from the relatively unstructured conglomeration of utterances the child hears in the language environment. McNeill (1966) suggested that infants are born with a hierarchy of linguistic categories, such as sentence, noun phrase, verb phrase, and the basic grammatical relations. The viewpoint regarding the innate language acquisition device has changed considerably due to the impact of Piaget's (1952) research on cognitive development. Although there is research evidence for some sort of innate predisposition for language in the human brain, children are now seen by several researchers in the field of child development (Bloom, 1970; Bowerman, 1974; Moerk, 1977) as actively involved in the language acquisition processes.

In addition, Chomsky's (1957) "competence/performance" distinction is vividly discussed by researchers, and it is felt that this distinction may no longer be useful. According to Chomsky's (1957) theory, "competence" relates specifically to the child's knowledge of its language, i.e., to its grammar which will enable the child to understand and generate an

infinite number of grammatical sentences of its language, and no non-sentences of its language. "Performance" refers to the actual use made of that knowledge. The concepts of linguistic competence and performance have been judged in terms of competence as being more important than performance. Linguistic competence has been regarded as intrinsic knowledge underlying performance. Linguistic competence would describe the all and only perfect grammar of a language, while linguistic performance, on the other hand, would describe the less ideal sentence production by an individual due to his limitation, short attention span, limitation in memory, etc. The problem with this distinction is that it has cut off research into the development of linguistic strategies used by children who are not born with the ideal language acquisition device. When such children "slip up" on rules, the obvious parallels to normal adult and child performance is ignored and deviance is attributed to such findings (Simmons & Baltaxe, 1975). There has been a gradual change in the viewpoint of the "competence/performance" distinction, especially in the recognition of the fact that both competence and performance abilities are functionally linked with CNS. In light of this shift, different theoretical approaches in regard to the language behavior of children with language impairment are necessary.

With regard to the nature of the language dysfunction of "autistic" children, Hermelin and O'Connor (1967; 1970) utilized a different experimental design to determine the linguistic competence of these children. In a series of psychological studies, the researchers used the presentation of verbal material to the children for immediate recall

through verbal repetition. The experimental designs had further control for a specific language feature, i.e., structured versus unstructured verbal material. The researchers' rationale for these studies is based on the observation that auditorily presented material enters the short-term store where it is held for a short period of time before being transferred to a channel in which coding and categorizing take place. The process of recall, especially of meaningful verbal material, includes the retrieval of that material from a "classified dictionary" type of storage system. Accurate recall for more meaningful material is partly due to the child's ability to reconstruct the items to be recalled by associating or guessing. These processes take place on the basis of the child's previous experiences with its environment, its previous knowledge of the property of the language, and its concepts and categories. Communicative behavior as well as recall depend upon patterning and coding for their significance and usefulness. These operations, as far as words are concerned, are most efficiently performed if the pattern conforms to the contextual confines of the common language.

It was the researchers' hypothesis that "autistic" children did not utilize classifying and patterning operations to help them in their recall. Furthermore, recall of structured and unstructured material would differ less in "autistic" children. Groups of "autistic", subnormal and normal children (N = 12 for each group) were matched for their scores on the Peabody Picture Vocabulary Test (Mean of C.A.: 11.9 years, ranging from 3.6 years to 15.8 years; Mean of M.A.: 3.10 years,

ranging from 1.11 to 7.10 years). The children were asked to repeat different series of words in response to the experimenter. Three procedures were used in the experiment: (1) recall of sentences of infrequent words; (2) recall of sentences of frequent words; (3) recall of random sequences of frequent words. Each set included six messages of equal word count and all words were monosyllabic. The results obtained were:

1. No intragroup differences between recall scores for sentences in which many low frequency words were found, but the "autistic" children had higher overall recall scores than the other two groups.

2. There were no differences between recall of sentences of infrequent words and random sequences of frequent words. "Autistic" children did better under both conditions than normal and subnormal children.

3. While no differences in recall between random arrangements of frequent words and sentences with matched word frequence were found in the "autistic" groups, normal and subnormals did significantly better with sentences than with nonsentences.

The results confirmed that there was no deficiency in the capacity of the short-term memory store in "autistic" children. On the other hand, while the coding and classifying process improved recall in the control groups, the "autistic" children did not utilize the advantage of recalling coded and classified items.

Since verbal material tends to be sorted most efficiently in terms of categories and concepts, words are often recalled in "clusters" which

conform to such categories. If words beyond the memory span have to be recalled, and if they fall into a limited number of categories, then related items tend to be recalled together, and the degree of such clustering and the extent of recalling are correlated.

Hermelin and O'Connor designed another series of experiments with "autistic", subnormal and normal children in which they presented sequences of eight words to the subjects which could be regrouped and recalled through such clustering. It was supposed that the regrouping would have to take place in the coded rather than in the short-term storage. An example of the sequences presented was "blue three red five six white green eight". The result showed that regrouping according to categories occurred significantly less often with "autistic" than with "nonautistic" children.

In a further test to determine the relative predominance of recall from the short-term storage, the researchers presented messages of eight words matched for frequency to the groups of subjects. Each eight-word message could be divided into two sections of four words. The arrangement of these two sections was either of two random four-word messages like "Half egg nick might got dress put," or of two four-word sentences, for example, "watch the green light; eat bread and jam." In addition, there was one set of random-sentence arrangements, i.e., "wall long cake sand' where is the ship?" and a sentence-random series like "when can they go? Know toy what cross." The result showed that "autistic" children tended to recall the latter part of a message regardless of its degree of sequential probability. The difference between random

and sequential material was less marked in the "autistic" children than in the normals.

The results seem to prove the researchers' hypothesis of qualitative differences in comprehension processes of "autistic" children when compared with other groups. Although this series of studies seem to be the strongest claim so far in the available literature about the qualitative differences of "autistic" children's language behavior, the studies do reflect some difficulties:

1. Only the scores for the three- and four-word messages were statistically analyzed since "too many scores of 0 were obtained for longer messages." The studies fail to readh a length ceiling effect for the "autistic" children. The "autistic" children's ability to repeat may have been underestimated.

2. The data collection procedures were heavily dependent on the child's language performance under increasing degrees of difficulties over a lengthy period of time. The length constraint on a language performance task might have affected the performance of the "autistic" grcup.

3. The children's performance may have been influenced by the rather monotonous form in which the verbal material was presented, i.e., at a constant rate of two words per second under all experimental conditions.

Summarizing the above research findings, it is important to consider variables like noncompliance behavior, attention factors and monotonous presentation which may affect the quality of performance of children labeled "autistic". Finally, additional research of syntactical mediation

on recall tasks with these children are necessary to help understand the widely accepted notion of deviant language behavior in these children.

Semantic investigations. The noticeable trend in today's linguistic research is the overemphasis on generative grammar and an apparent neglect of semantics. This trend obviously influenced the language research in the field of psychopathology. There are only a few studies available which analyze the "autistic" language behavior in relation to the semantic aspect of the language development.

According to Kanner (1946), the speech of "autistic" children has its own, private, individualized references, while to the outside world their utterances appear "irrelevant, bizarre, and metaphorical". An example of this observation is demonstrated by a child's sudden remark at the dinner table: "You'll get nothing at all," which derives from hearing another child being told that he will not get any more dinner unless he eats up what is already on his plate. This illustrates the "extreme literalness" (Kanner, 1946) with which "autistic" children use language. They appear to be unable to use language to fit a new situation, and seem only able to understand words or utterances in their originally acquired situational or behavioral sense.

In relation to the area of semantics, researchers emphasize the importance of function, cognitive structure, and semantic development as possible antecedents of language which appear before the child has acquired any language skills (Bruner, 1967, 1974; Moerk, 1977; Sinclaire-de Zwart, 1971, 1973). Studies in early child development

indicate that the infant searches out and actively tries to "assimilate" new stimuli (Piaget, 1952). The "curiosity drive" or "exploratory drive" leads to the important function of question-answer interaction with the environment. The search for new stimulation leads further into the very basic function of cause-effect relationship between stimulus source and sensation. These important observations by the infant seem to provide some first cues regarding the development of basic cognitive principles. For example, if the infant reacts to a stimulus by searching for its source, it demonstrates the principle of causality (Piaget, 1952).

Language in this present study is seen as a systematic system. This system is defined as a tool to convey information from a sender to a receiver. The transmission of meaningful information presupposes a child who has developed meaning before it can begin to convey information intentionally to its surrounding. The important questions to ask in regard to a child labeled "autistic" is: How does this child use echolalia in his attempt to communicate? Some researchers have acknowledged that echolalia is used by "autistic" children in different ways. Explanations range from the claim that the imitations of the child express some type of negativism or hostility toward the speaker, to a more optimistic approach where the repetitions are thought to be an attempt of the child with a faulty comprehension mechanism to establish and maintain contact with the speaker

(Fay, 1969). Fay (1969) supports the notion that the presence of mitigated echolalia represents not only a willingness to communicate, but also represents an early level of existing language behavior with significant internal structural correlates for the eventual development of language. He also relates the occurrence of echolalic responses with the type of questions used by the examiner. It was hypothesized that, when the questioning forms are abstract, a comprehension problem is presented for the child, and more echoic responses are elicited than simpler forms. This hypothesis was supported by the results; simple yes/no and naming questions produced significantly less echoic responses than what he termed elaboration questions, or non-labeling wh- questions. This finding, in turn, lends support to the idea that the "autistic" child wants to communicate, but meaningless repetitions of the original question result when comprehension is lacking.

Baltaxe and Simmons (1975) mentioned the use of echoic patterns for the function of labeling, e.g., the repetition of a question such as "do you want some water?" may express the desire for water. Baltaxe and Simmons (1976) also argued that echolalia could be regarded as a positive behavior in atypical children, and could be actively utilized by the child in acquiring language skills. Although it is not the normal acquisition process, it is nevertheless useful. This conclusion is derived from their attempt to analyze the bedtime soliloquy of an "autistic" child for evidence that language may be acquired through "breaking down" and restructuring of echolalic utterances. However, this study is criticized in terms of the diagnostic criteria for "autism". There were no symptoms noted in their subject prior to the age of three.

Normal language occurred until that age; hence, the diagnosis of "autism" was questionable.

Shapiro, Robert, and Fish (1970) devised five categories of echolalic speech production in psychotic children: (1) rigidly congruent echoes, (2) jargon additions, (3) telegraphic, inflectional changes, (4) grammatical restructuring, and, (5) nongrammatical fragments. Comparing the echoic patterns of eight schizophrenic and three nonschizophrenic hospitalized children with those of three control groups of normal children (six in each group of two, three and four year olds), their study revealed interesting data. In a free speech situation, rigid echoing occurred more frequently in the schizophrenic children than in any other categories. The same was true for the nonschizophrenic children.

Echolalic Phenomenon Related to Normal Language Development

The reviewed literature regarding the semantic aspect of echolalic speech patterns in "autistic" children indicated that the children do not echo in a "tape recorder" fashion. Rather, the echolalic responses demonstrate alteration, selectivity, and mitigation, which suggests that "autistic" children use a pattern to convey meaning.

It also can be concluded that the above "semantic" investigations lack diagnostic clarity to justify any semantic characteristic which is symptomatic to early infantile "autism". Furthermore, it is important to note that there is enough evidence that echolalic speech behavior exists in other pathological and normal children. It is well-known that in the early developmental stages, normal children echo familiar

utterances but ignore those which are considerably beyond their linguistic competence (Slobin & Welsh, 1973). Since echolalia is a form of imitative behavior, it might be usefully related to the normal role that imitation plays in language development.

Research with normal children indicates that imitation tasks can provide valuable information regarding the current level of a child's language functioning (Bloom, 1974; Menyuk, 1968; Slobin & Welsh, 1973). It was found in imitative experiments in which children were asked to imitate sentences longer than their short-term memory could handle, that imitation was processed through the child's productive language system.

In an attempt to discover the underlying linguistic competence, Slobin and Welsh (1973) elicited imitation from a single child "Echo". On the basis of these findings, they concluded that imitation plays a small role in the process of acquiring the rules of language. However, simple imitation could not account for the novel utterances produced by a child from the time he first begins to put words together. It was postulated that a rule-abstracting comprehension system is utilized when the child is learning the expressions of grammatical relations.

In addition to their findings in this study, Slobin and Welsh (1973) favored the use of elicited imitation as a research tool in future child language studies. They stated:

> A fine-grained analysis of repeated imitations of systematically varied model sentences can reveal aspects of the child's theory of syntax, including transformational rules and the syntactic and semantic markers born by lexical items (p. 496).

The value of elicited imitation in the study of child language has been recognized by a growing number of researchers. A general agreement among these researchers is that elicited imitation of sentences beyond the auditory memory span of the subject is reflective of the child's currently operative linguistic capacity.

Closely related to the issue of elicited imitation performance is the focus on transformational grammar. In virtually all present studies of child language, researchers concentrate on the effects of syntactic complexity on imitation performance. A reasonable question to ask is whether sentence length, coupled only with syntactic complexity, is sufficient to account for imitative performance.

More recently, researchers such as Schlesinger (1971), Bloom (1974) and Brown (1973) addressed themselves to the importance of semantic relations in early language development. Brown (1973) suggested that cumulative grammatical and semantic complexity proves to be the primary determiner of acquisition order in young children. These research results are indicative of a shift in child language studies. Researchers are recognizing that grammatical complexity is not the only way to account for linguistic performance; semantic relations are also important determiners of language acquisition. As reported in the literature, four semantic relations emerge very early in the language of young children (Bloom, 1970; Brown, 1973; Schlesinger, 1971; Slobin, 1970), and are defined by Schlesinger (1971) with reference to position and function; he provides examples of these semantic relations.

1.	AGENT - ACTION	Bambi go
2.	ACTION - OBJECT	See sock
3.	POSSESSIVE	Baby car
4.	LOCATIVE	Baby highchair

In addition to length, grammatical complexity and semantic complexity of stimulus sentences, Schlesinger (1971) discussed other possible factors influencing imitation performance. He proposed an important factor, the "intention to speak". He claimed that the base component of an utterance is the intention which is preverbal and, in a sense, is composed not of morphemes or words but of concepts. He classified these intentions as "I" markers which become sentences through the application of realization rules.

Other researchers addressed the above issue and noted that the "intention to speak" is an important variable which may affect speech production of young children. In their study, Slobin and Welsh (1973) found that if the child "Echo" was offered a fairly long and complex self-produced utterance as a model, she could repeat her own utterance only if the imitation occurred immediately. However, if the very same utterance was presented to the child 10 minutes later, she was frequently unable to imitate. In the discussion Slobin and Welsh interpreted this phenomenon as follows:

> It would seem that the child has an intention to say so and so--to use William James' phrase--and has encoded that "intention" into linguistic form. If that linguistic form is presented for imitation while the intention is still operative, it can be fairly successfully imitated.

> Once the intention is gone, however, the utterance must be processed in linguistic terms alone--without its original intentional and contextual support. In the absence of such support, the task can strain the child's abilities and reveal a more limited competence than may actually be present in spontaneous speech (pp. 489-490).

A study by Bloom (1974) also corroborated the influence of intention and context on imitation performance. She called the non-linguistic events surrounding the speech act "external context" and the speaker's intentions, which may or may not be related to the external context, "internal context". To date, a methodology which investigates a speaker's intention or internal context is not available, but external contexts can be controlled to some extent and the relative influence of the immediate events on children's speech behavior can also be investigated. Therefore, any study of child language which utilizes elicited imitation should investigate semantic complexity and grammatical complexity as well as external and internal context. The recommended focuses were implemented in the present study and, and in light of these research findings, elicited imitation can now be used as a research tool to efficiently study children's speech patterns, including the "autistic" child's speech.

In summary, echolalia in "autistic" children is considered an important criterion in the diagnosis and prognosis of the syndrome. Existing data are derived from two major research positions: (1) clinically based studies, attributing behavioral pathology to the language behavior, and (2) linguistically based studies, emphasizing syntactic aspects of grammatical performance. While no specific analysis

for the semantic aspects of the language behavior of echolalic "autistic" children on imitation tasks exists, the present study has focused on the semantic relations and their use in the language of these children. The study further provides data about the interaction effect of semantic and syntactic complexity on the children's ability to imitate.

In conclusion, this chapter has reviewed the literature relevant to (1) language development in "autistic" children, both nonlinguistic and linguistic features, and (2) the echolalic phenomenon, related to normal language development, especially to studies investigating elicited imitation as a research tool to study children's linguistic capacity. In the following chapter, five hypotheses are derived from both the theoretical position as presented in Chapter 2 and from the results of the preceding review of the literature.

CHAPTER 4

HYPOTHESES

Deviant language development is considered an important factor in the diagnosis and prognosis of "autistic" children. A reliable description of the specific nature of this deviance is essential for a complete understanding of the disorder. It can be concluded from the review of the literature that a description of the specific nature of the deviant processes involved in echolalic "autistic" children's language behavior is not yet available. The present study attempted to answer the overall question as to whether echolalic "autistic" children use language forms which are appropriate for younger normal children (quantitative differences) or whether echolalic "autistic" children utilize different linguistic forms in the language acquisition process (qualitative differences). The following research questions were studied:

(1) Is there a differential effect of Mean Length of Utterance (MLU) on echolalic "autistic" children's ability to imitate?

(2) Is there a differential effect of presence or absence of external contextual manipulation on echolalic "autistic" children's ability to imitate?

(3) Is there a differential effect of syntactic constructions on echolalic "autistic" children's ability to imitate?

(4) Is there a differential effect of semantic relations on echolalic "autistic" children's ability to imitate?

(5) Is there a semantic - syntactic interaction effect on echolalic "autistic" children's ability to imitate?

Five specific hypotheses were derived from these research questions, the theoretical position presented in Chapter 1, and from the results of previous studies reviewed in Chapters 2 and 3.

Hypothesis 1 (H_1):

In regard to the overall level of language development, the echolalic "autistic" children with higher Mean Length of Utterances (MLU) will be more successful in elicited imitation performance.

The first hypothesis (H_1) was derived from research with normal children which has indicated that imitation tasks can provide valuable information regarding the current level of a child's language functioning (Bloom, 1974; Menyuk, 1968; Slobin & Welsh, 1973). Bloom (1974) hypothesized that the underlying premise in elicited imitation is that children process sentences which exceed auditory memory according to what they know about the grammar of their language. In other words, if a sentence is beyond the child's grammar or is too long for a child to hold in memory, the child will "process the meaning of the sentence, and his imitation of it, although shorter and inexact, will provide some evidence of (1) the extent to which he understood it, and (2) what he knows about speaking such sentences" (p. 298). This hypothesis is confirmed with normal children. The question is, Does this hypothesis hold for language impaired children, such as the "autistic" child? If so, then what the "autistic" child knows about the language and of his environment can be revealed through the systematic use of elicited imitation of selected sentences which exceed short-term memory. There is little data available concerning the performance of "autistic" children

on similar tasks (Frith, 1969, 1970; Hermelin & O'Connor, 1967, 1970; Voeltz, 1976).

Closely related to the testing of H_1 is the issue of how to measure language development of echolalic "autistic" children. The findings by Brown (1973) may be very helpful in solving this problem. He stated that, "Mean Length of Utterances is an excellent simple index of grammatical development because almost every new kind of knowledge increases length" (p. 53). It would be of particular value if this assumption also holds true for language impaired children. Therefore, this index was selected for the present study. It is especially appropriate for examining the earlier stages of linguistic development when the utterances are very short and simple. It has been stated that these early utterances are quite sensitive to length changes caused by new grammatical information.

Methodological problems with assessing representative language samples from echolalic "autistic" children have plagued much of the previous research. The present study modified the general procedure of collecting representative language samples from these children. It is expected that children who have significantly higher MLUs will also imitate the test items with greater accuracy.

Hypothesis 2 (H_2):

In regard to the role of context, echolalic "autistic" children will imitate sentences with greater accuracy when there is external contextual support than when there is no context.

Considerable evidence in support of this assumption was provided in studies by Bloom (1974), Slobin and Welsh (1973) and Schlesinger (1971).

The studies indicated that children do not simply utter sentence frames but that they speak about things in their external and internal environments. Bloom (1974) specifically corroborated the influence of context on imitation performance. She called the non-linguistic events surrounding the speech act "external context", and the speaker's intentions, which may or may not be related to the external context, "internal context". To date, a methodology which investigates a speaker's intention or internal context is not available, but external context can be controlled to some extent and the relative influence of the immediate events on children's speech behavior can be examined. To explore this dimension further, the present experiment provided two conditions of stimulus sentence presentation in an elicited imitation task. It is expected that the additional information available to the subjects in the contextual condition will facilitate more accuracy in imitative performance.

Hypothesis 3 (H_3):

In regard to the four syntactic constructions: (1) Simple Active Affirmative Declarative (SAAD), (2) Inversion Interrogative (INV INT), (3) Embedded (EMB), and (4) Passive (PASS), the echolalic "autistic" children will make fewer correct responses to the later evolving (EMB and PASS) syntactic constructions than to the early evolving (SAAD and INV INT) syntactic constructions.

There is general agreement in the literature about the emerging sequence of syntactic constructions. Simple Active Affirmative Declarative (SAAD) is considered as one of the earliest emerging syntactic forms in young children's language. It is expected that echolalic

"autistic" children would correctly use this construction frequently. Inversion Interrogative (INV INT) is considered the least derivationally complex form of question and emerges in Stage II (Brown, 1973). In contrast, relative clauses (EMB) and all passives (PASS) are syntactic constructions which emerge relatively late in the language acquistion process. In so far as imitative performance reflects language knowledge it is expected that echolalic "autistic" children will make fewer correct responses to the late evolving syntactic constructions than to early evolving forms.

Hypothesis 4 (H_4):

In regard to the four semantic relations: (1) Agent-Action (A-A), (2) Action-Object (A-O), (3) Possessive (POSS), and (4) Locative (LOC), the echolalic "autistic" children will make fewer correct responses to the late evolving (POSS and LOC) semantic relations than to the early evolving (A-A and A-O) semantic relations.

Hypothesis 4 was derived from the evidence presented in Hypothesis 2. Researchers such as Brown (1973), Schlesinger (1971), and Bloom (1970) addressed themselves also to the importance of semantic relations in early language development. Bloom (1970) discussed the phrase "mommy sock" in which she described this utterance according to the child's semantic intention, rather than in terms of Braine's (1963) pivot - open grammar. Bloom claimed that a child's two-word utterance, though identical in surface form, actually may be expressing quite different semantic intentions, or meanings. When analyzed by semantic relations, the utterance "takes on richer meaning". That is, when the child says: "mommy sock"

as he sees the mother putting on his sock, the expression conveys something about the relationship which occurs between an agent (mommy) and an object (sock). But it also can express a genitive, as the child picks up mommy's sock.

The aforementioned researchers have studied children's two-word utterances and offered their interpretations of the basic set of prevalent meaningful relations evident in young children's language. In spite of variation in the interpretations, these researchers agreed on the same general notion that the child intends to express relational meanings. The authors also agreed on some relatively early evolving concepts that young children express--identity (that hat), recurrence (more milk), non-existence (all gone), location (baby highchair), possession (baby car), agent, action, and object-of-action--which are communicated when the child uses two particular words in a particular context.

This emphasis on the importance of meaning in the analysis of children's language leads quite naturally to considerations of concepts themselves and relationships between emerging concepts and the learning of language forms. For example, Bloom (1970) has claimed that learning to distinguish and to understand certain conceptual relations, that is semantic relations, must precede acquisition of a linguistic code, and that such knowledge directs later usage of the code. This claim is in general agreement with other researchers such as Slobin (1973), Bowerman (1973), Schlesinger (1971), and Chafe (1970). These researchers go on to claim that the development of syntax is a tool the child acquires to transmit this basic set of semantic relations in more complex and original ways.

Remembering the basic assumption that child performance on elicited imitation tasks reflects the child's knowledge of language, it is not surprising that semantic relations influence the child's response. It is the major objective of the present study to find out about echolalic "autistic" children's knowledge of semantic relations.

Brown's (1973) data revealed the finding that the agent and action relation as well as the action-object relation were universal at Stage I, while the possessive and the locative relations were not as frequently used in Stage I. Therefore, it was assumed in this study that the possessive and the locative relations are slightly later evolving than agent-action and action-object relations.

This assumption is a matter of controversy in the present literature in the field of child language acquistion. Leonard (1976) argues that the locative relation evolves even earlier than agent. His sequence of emergence of the four semantic relations under investigation is as follows: (1) action, (2) locative, (3) agent, and (4) possessive. H_4 was derived to explore the "autistic" child's knowledge of semantic relations and, therefore, it is expected that this knowledge will influence elicited imitative performance. H_4 was also developed as a way to find out how semantic relations influence the language use of echolalic "autistic" children. It is therefore expected that echolalic "autistic" children might make fewer correct responses to later evolving semantic relations (POSS and LOC) than to early evolving (A-A and A-O) semantic relations.

Hypothesis 5 (H_5):

In regard to the joint impact of semantic and syntactic complexity, if the syntactic construction is beyond the linguistic capacity of echolalic "autistic" children, they will nevertheless retrieve the underlying meaning (semantic relations).

This hypothesis is related to H_1, H_2, H_3, and H_4. Bloom's (1970) claim, that semantic relations must not only precede acquisition of a linguistic code but also direct later usage of the code, reflected the growing belief among researchers in the field that it is cumulative grammatical and semantic complexity which is probably the primary determiner of acquisition order in young children (Brown, 1973). While Slobin (1973) discussed the issue of cumulative complexity in language acquisition in a slightly different way from the above authorities, he still viewed the interaction role of semantic and syntactic complexity as important in language acquisition. Slobin seems to weight the formal linguistic complexity differently than the semantic complexity in the order of development of grammar in young children. He stated that "although one can talk about order of acquisition in terms of semantic or cognitive complexity, there is clearly a point at which formal linguistic complexity also plays a role" (p. 181). It is not quite clear, though, how he views the formal linguistic complexity and its role. In spite of the slight difference between Slobin and Brown, one can draw the conclusion that grammatical complexity alone is not sufficient. It is also important to note that the knowledge of semantic relations is an important determiner of language acquisition in young children who normally develop language as well as in those who seem to develop

language in a slower or "deviant" way. Therefore, it is expected that echolalic "autistic" children may preserve the underlying meaning even when confronted with complex grammatical information.

Summary

This chapter has presented five hypotheses derived from theoretical and historical perspectives presented in Chapter 2, and from the results of the review of the literature presented in Chapter 3. The next chapter presents the method and the statistical design used in this study to test the five hypotheses.

CHAPTER 5

METHOD

This chapter describes the sample selection, the material used in the elicited imitation task, the procedures, the scoring system, and the research design.

Sample Selection

Thirty-five children were identified as potential subjects to participate in the present study. These children were enrolled in educational settings in which diagnostic and performance data were available. These children attended four different schools for "autistic" children. Once the schools approved the research project (see Appendix A), the subjects were selected according to the following criteria:

1. Parental permission: The investigator obtained permission from the parents or guardians of all the children included in the study.

2. Performance: The children were selected on the basis of a minimum Mean Length of Utterance (MLU) of 1.5 morphemes and a maximum MLU score of 3.5. This index places the children at Brown's (1973) Stages I, II, and III. Three children were excluded because they did not attain the minimum MLU criterion score, while two children were excluded because they exceeded the maximum MLU score. In addition, the children had to perform an imitative response to stimuli sentences. Three children were excluded from the study sample because they refused to repeat the sentence stimuli in the imitation task.

3. Normal hearing acuity: All the subjects had normal hearing acuity according to audiometric testing data.

4. Monolingual environment: All the subjects were to be native speakers of English. One child was excluded from the sample because English was not the native language.

5. Diagnostic Criteria: The absence of primary diagnostic criteria, described by Simmons and Tymchuk (1973), excluded six children from the study sample.

A total of twenty children, enrolled in one of the four school programs, fulfilled all the above-mentioned criteria and constituted the study sample.

The diagnosis of "autism" was based on the six core characteristics described by Simmons and Tymchuk (1973) which are in general agreement with the description of other authors (Creak, 1961, 1964; Kanner, 1943, 1946; Rimland, 1964; Rutter, 1974). These categories are:

1. Impairment of interpersonal relationships characterized by aloofness, decreased physical contact, and lack of eye contact.

2. Deficits in social behavior seen in severe limitations in cooperative play, toy play, and self-care skills.

3. Stereotyped activities including self-stimulatory behavior, various kinds of repetitions, and preoccupations with sameness.

4. Impairment of intellect manifested by concreteness of thought, school performance deficits, and difficulties with judgment and abstract thinking.

5. Disturbances in speech and language seen in various forms, such

as mutism, echolalic speech, delayed development, and a variety of other idiosyncrasies in word usage, speech modulation, and content.

6. Onset prior to the age of 30 months (Simmons & Tymchuk, 1973, pp. 665-673).

Each child's case history was discussed with the speech therapist, the teacher, the social worker, and/or school principal. According to one school setting's admission rule, the Rutter scale (1974) was accepted as diagnostic criteria, because there are no major differences between the Simmons and Tymchuk and Rutter diagnostic schemes (See Appendix A). Available data about EEG abnormality was included because it is very well known that overt neurological signs become clinically manifest when the children become older (Rutter, 1971). Three of the twenty subjects developed seizures with the onset of puberty. Finally, the speech therapist or the teacher reported about the children's language development. It was said that all children exhibited echolalia, though four children were observed to use spontaneous speech sporadically. Table 12 summarizes the demographic data of the sample.

In order to obtain optimal language performance, children were tested either by the speech therapist or by the classroom teacher in both research tasks. In each school setting, testing was carried out in a familiar surrounding for the child, either in the speech therapist's office or in a one-way mirror observation room which was used for speech therapy.

The MLUs for each child were computed from 50 consecutive, intelligible, nonimitated utterances elicited from the child in a child-teacher/child

Table 12

Demographic Data: Subjects

STAGE	SUBJECT	AGE	MLU	PPVT/MA	SEX	MEDI-CATION	EEG
I	1	16.11	1.5	3.08	M	Yes	Normal
I	2	15.08	1.5	3.0	M	Yes	Normal
I	3	14.10	1.7	2.10	F	Yes	Abnormal*
I	4	20.05	2.1	3.05	M	Yes	Normal
II	5	9.04	2.2	3.0	M	No	Normal
II	6	8.07	2.4	2.09	M	No	Normal
II	7	7.08	2.3	3.0	M	Yes	Normal
II	8	11.06	2.6	4.08	F	No	Normal
III(a)	9	11.02	2.8	2.08	M	Yes	Normal
III(a)	10	17.07	2.9	4.09	F	Yes	Normal
III(a)	11	5.04	2.8	4.02	M	No	Normal
III(a)	12	5.05	2.9	3.03	M	No	Normal
III(b)	13	7.05	3.0	3.09	M	No	Abnormal*
III(b)	14	7.11	3.1	3.11	M	No	Normal
III(b)	15	9.04	3.2	4.03	M	No	Normal
III(b)	16	14.03	3.2	5.01	M	Yes	Abnormal*
III(c)	17	7.02	3.3	3.05	M	No	Normal
III(c)	18	8.01	3.3	3.09	M	No	Normal
III(c)	19	7.09	3.3	3.06	M	No	Normal
III(c)	20	8.10	3.5	4.03	M	No	Normal
4:4:12	N=20	$\bar{x}$ =10.08	$\bar{x}$ =2.7	$\bar{x}$ =3.3	3:17	8:12	3:17

*- EEG: Beginning of seizure by puberty

speech therapist free-play interaction. Brown's (1973) method for calculation of MLU was used. With respect to the major difficulty in collecting a representative language sample of "autistic" children, it was decided to modify the general procedure of collecting 100 utterances to 50. It was felt that the collection of 100 utterances would have become an overwhelming task with children who are characterized by their lack of spontaneous speech. Furthermore, Lee (1971, 1974) also used 50 consecutive utterances for the Developmental Sentence Analysis which seemed to justify the modification of the general procedure in the present study.

On the basis of MLU, children obtaining 1.50 - 2.10 morphemes per utterance were placed in Stage I. Children with MLUs of 2.20 -2.60 were placed in Stage II; 2.80 - 3.50 morphemes per utterance indicated Stage III.

The 20 children fell into Stages I, II and III with the frequencies 4, 4, and 12 respectively. It was decided to divide the 12 subjects in Stage III into three artifical subgroups with low (2.8-2.9), medium (3.0-3.2), and high (3.3-3.5) Stage III MLUs. This decision was influenced by the fact that the equal N in each Stage group and sub-group facilitated the analysis process.

Sentence Imitation Stimuli

In accordance with an investigation by Lehner (1976), a 64-sentence imitation task was used in the present study. The 64 sentences were divided into two parts of 32 items each. One part of the imitation task (32 sentences) was presented simultaneously with external contextual manipulation of toy objects, while the other part of the task (32 sentences)

was administered without the presence of such toy objects. Each group of 32 stimuli sentences was divided into four semantic relations: (1) Agent-Action (A-A), (2) Action-Object (A-O), (3) Possessive (POSS), and (4) Locative (LOC). These major relations define position and function between agents, actions and objects. The selection of the relations were based and formulated by Schlesinger (1971). He states that "the child must learn position rules which accord to each word -- or, rather, 'concept' -- in the intention to say so and so, its position in the utterance, and category rules, which determine the grammatical category that is appropriate in a given position" (p. 72). Other authorities in the field also define these major relations.

Fillmore (1968) defined Agent and considered the agent as the animate initiator of action, while Chafe (1970) stated that the agent could include inanimate entities as well. In this study, agent refers to someone or something who/which initiates an action or process. Action involves any movement. Agent-Action examples are: dog jump, cat sleep.

Action-Object. Fillmore (1968) considered the object as a residual case, while Chafe (1970) considered the object as someone or something suffering a change of state, and Brown (1973) viewed an object as someone or something receiving the force of action. In this study, the Action-Object relation refers to a movement or process with someone or something receiving it. Action-Object examples are: eat cookie, push truck.

Possessive. Schlesinger (1971) categorized the possessor and possession relation as someone or something who/which is specified as owner of someone or something. In this study, the possessive relation

is the same as the Schlesinger (1971) category. Examples are: boy truck (boy's truck), baby bottle (baby's bottle).

Locative. In the present study, the locative relations are the same as the Schlesinger (1971) categories. The locative relation refers to any goal-directed movement and its entailed goal or to someone/something existing in a specified space. Examples are: sit chair (girl sits in the chair), or kicked leg (boy was kicked in the leg).

Each semantic relation occurred twice in each of the four syntactic constructions under each presentation type (Context/Non-Context). In other words, each semantic relation occured 8 times in the Context condition and 8 times in Non-Context condition.

A major objective of the present study was to investigate the joint impact of semantic and syntactic complexity on echolalic "autistic" children's ability to imitate, so the four syntactic constructions selected for this study varied in difficulty. It is expected that if the syntactic construction, like Embedded (EMB) or Passive (PASS), is beyond the linguistic capacity of the child, he will nevertheless retrieve the underlying meaning.

The four syntactic constructions were:

Simple Active Affirmative Declarative Construction (SAAD). According to Brown's finding (1973), this construction emerges very early in Stage II. In traditional syntactic terms, a SAAD sentence consists of: Subject + Verb + Object with a transitive verb. Examples of this construction are: The mother is kissing the child, or, The girl plays with the doll.

Inversion Interrogative Construction (INV INT). This construction is considered to be the least derivationally complex question form and evolves during the holophrastic stage. Although wh- questions also meet this basic definition, yes/no questions with inter[illegible]rsive reversals were only looked at in this study. Examples are: Is the toothbrush in the bathroom? or, Is drinking cold milk good for you?

Embedded Construction (EMB). There are many different kinds of syntactic embedding forms in the English language, but in this study only the relative clause was used. The relative clause either modified the subject or the object of a noun phrase. Examples are: The man who is tired is sleeping; or, The boy that I see is running.

Passive Construction (PASS). This construction is a syntactic focusing device in which the normal object of a transitive sentence assumes the subject. The original subject is marked by a prepositional phrase, and the verb form is the past participle. Examples are: The child ate the cookie (the cookie was eaten by the child).

The format used for the stimulus sentences of the imitation task was in accordance with a study by Lehner (1976). The content vocabulary was limited to words which were in the Thorndike and Lorge (1959) list of the most freqeuntly occurring 1,000 words, or words which occurred in Golden Book's Picture Dictionary for Children. The combination of content words was controlled to avoid duplication within the same semantic or syntactic category, although many of the content words appeared more than once in the test sentences. All nouns in the test sentences were singular. Each stimulus sentence was between seven and nine morphemes in length (Lehner, 1976). An example of the imitation task is presented in Appendix B.

Procedure

Considering the extensive language sampling problems with echolalic "autistic" children, 50 consecutive, intelligible, nonimitative utterances, rather than 100 utterances, were collected in a free-play session with the child and examiner (speech therapist or teacher). Time span for computing each MLU ranged from 35 to 68 minutes.

In order to stimulate the language of subjects a variety of toys, books (The Berenstein Bears , New Baby; Walt Disney's Happy Healthy Pooh Book; Tibor Gergely, Busy Day, Busy People; and Three Little Pigs), and puppets were used. Throughout the session the researcher stayed in the testing room and transcribed all of the children's utterances. For subsequent verification of the written transcriptions, and also for collecting non-linguistic behavior, the subject-examiner interactions were also video-taped.

The examiner started the session by saying, "Today we are going to play a game called copy cat. You say what I say", and then picking one of the toys and saying: "Say doll". The trial examples were built up from one-word repetitions to full-length sentences like the stimulus sentences in the test (7-9 morphemes). When the child responded, reinforcement was given according to his individual reinforcement schedule. This ranged from primary reinforcement after each positive response to secondary reinforcement -- a hug or a tickle from the examiner for ten minutes of on-task behavior -- up to verbal reinforcement for all children. Once the child was imitating consistently, the examiner presented the experimental sentences. An interval phrase of approximately two seconds was necessary to avoid immediate echolalic response during experimental presentation

("say what I said, or repeat what I said"). An item was considered complete when the child repeated at least one word from the stimulus sentence. If a child responded with one word only but started the response over again without the examiner's cue, the second trial was counted. In the case of response refusal or unrelated response, three successive presentations of the same item were given before moving on to the next sentence. In eight instances testing was discontinued because: (1) the child failed to respond to the first 16 sentences; (2) the child was not compliant and/or, (3) the child seemed to be bored by the task. The testing of these children was continued within the next two days.

In order to prevent the establishment of perseverative responses within particular syntactic forms or semantic relations, the order of presentation of Context/Non-Context conditions and the order of presenting the stimulus sentences was altered systematically.

Under the external contextual manipulation part of the imitation task, the examiner showed an object which represented the subject and object noun (i.e., in the action-object semantic relation) to the child simultaneously with the presentation of a stimulus sentence. Except for the passive construction in both parts of the task, toys for subject and object noun were handed over to the child in order for him to act out the stimulus sentence. This additional procedure was felt necessary to verify the comprehension of the passive construction on the part of the child. For instance, with a sentence like: The boy was hit by the girl, the child showed by accurately acting out if he had understood that the girl was the agent and the boy the patient. This additional procedure

caused disruptive behavior in several instances. For many children it took three trials to get both the verbal response and the acting out. After three trials the examiner moved on to the next item.

In Non-Context condition, only the stimulus sentence was presented aurally and the child was asked to repeat. The time span for completion of the imitation task ranged from 42 minutes to 78 minutes. All interactions in the imitation task were also videotaped for subsequent verification. The subject's responses were transcribed by the researcher during testing.

Equipment

All interactions between children and examiners were videotaped. In three school settings the following equipment was used: Video-recorder: AV-3400, Video-camera: AVC-3400/Sony, Microphone: Video Rover, Elector-Voice 635, Videotapes: Scotch 361 - ½ - 1200 - R/148B or Scotch 361 - ½ - 2400 - R/153B.

In one school setting Sony U-matic 3/4-inch color cassettes were used, Tapes: UCA 60, Memorex.

Scoring

Brown's (1973) method for calculation of MLU was used, with the following rules added to define all productive utterances:

1. Where a child responded to a question by labeling numerous objects, the response was not counted.

2. When immediate repetition of an adult utterance occurred, the response was not counted. Table 13 presents mean length of utterance scoring rules.

Table 13

Rules for Calculating Mean Length of Utterance

1. Only fully transcribed utterances are used; none with blanks. Portions of utterances, entered in parenthesis to indicate doubtful transcription, are used.

2. Include all exact utterance repetitions. Stuttering is marked as repeated efforts at a single word; count the word once in the most complete form produced. In the few cases where a word is produced for emphasis or the like (no, no, no) count each occurrence.

3. Do not count such fillers as mm or oh, but do count no, yeah, and hi.

4. All compound words (two or more free morphemes), proper names, and ritualized reduplications count as single words. Examples: birthday, rackety-boom, choo-choo, quack-quack, night-night, pocketbook, seesaw. Justification is that there is no evidence that the constituent morphemes function as such for these children.

5. Count as one morpheme all irregular pasts of the verb. Justification is that there is no evidence that the child relates these to present forms.

6. Count as one morpheme all diminutives because these children at least do not seem to use the suffix productively.

7. Count as separate morphemes all auxiliaries. Also, all catenatives; gonna, wanna, hafta. These latter counted as single morphemes rather than as going to or want to because evidence is that they function so for the children. Count as separate morphemes all inflections, for example, possessive /s/, plural /s/, third person singular /s/, regular past /d/, progressive /In/.

8. Exclude list of items in response to questions.

9. Exclude immediate repetition of adult utterances.

For the imitation task the following scoring procedures were used:

1. With regard to semantic relations, each response was scored either correct (1) or incorrect (0). A semantic relation was scored correct if the response contained both of the lexical items in the relation. The response was also scored correct if a semantically appropriate lexical item was substituted for one or both of the lexical items in the stimulus semantic relation. A semantic relation was scored incorrect if one or both of the lexical items in the relation was missing. Table 14 presents the scoring procedure for the semantic relations.

2. With regard to syntactic constructions, each response was scored correct (1) or incorrect (0). The syntactic construction was scored correct if the response contained the necessary lexical items which fulfilled the structure of the sentence. The syntactic construction was scored incorrect if the necessary lexical items for the structure of the sentence were missing.

Table 15 presents the scoring system for the syntactic constructions. The scoring procedure for the Context versus Non-Context factor was identical to that described for semantic relations and syntactic constructions (see Table 14 and Table 15).

Reliability. Two students enrolled in a graduate course entitled "Childhood Language" in the Speech and Hearing Department at Indiana University were trained on the scoring procedures for language assessment (MLU) and the imitation task. Both students transcribed the full free-play interactions between children and examiners, calculated MLUs,

Table 14

Semantic Relation Scoring System

Semantic Relation	Score	Description	Example
Agent-Action	1	Response contains both agent and action	dog jump/the happy brown dog is jumping up and down
Action-Object	1	Response contains (1) both action and object or (2) a semantically appropriate substitution for one lexical item	throw ball/throw the big ball very quickly throw the hoop/throw the ball
Possessive	1	Response contains (1) both modifier and head or (2) modifier, 's and head	mommy cup or mommy's cup/mommy's pink china cup is very pretty
Locative	1	Response contains (1) object, preposition and location or (2) object and location	boat on lake, or boat lake/the boat which is big is on the lake

Table 15

Syntactic Construction Scoring System

Syntactic Construction	Score		Description	Example
Simple Active Affirmative Declarative	1	a)	Subj + aux + mv	dog is jumping/the happy brown dog is jumping up and down
		b)	Subj + mv	dog jump/the happy brown dog is jumping up and down
		c)	Subj + cop + pred adj	cup is pretty/Mommy's pink china cup is very pretty
		d)	mv + subj	throw ball/throw the big ball very quickly
		e)	Subj + loc	hat on chair/the green hat is on the blue chair
Inversion Interrogative	1	a)	Aux + subj + mv	is cat sleeping/is the furry black cat sleeping soundly?
		b)	Aux + mv + obj	is hitting girl/ is hitting a girl a nice thing?
Embedded	1	a)	Subj + aux + mv + cop + pred adj	man is sleeping is tired/ the man who is sleeping is tired
		b)	Subj + mv + pred adj	man sleep tired/the man who is sleeping is tired
		c)	mv + obj + cop + pred adj	kiss clown is funny/kiss the clown who is very funny
		d)	mv + obj + pred adj	kiss clown funny/kiss the clown who is very funny
Passive	1	a)	Obj + aux + mv + prep + subj	boy was hit by girl/the boy was hit by the girl
		b)	Obj + aux + mv	boy was hit/the boy was hit by the girl
		c)	Obj + mv + prep + subj	boy hit by girl/the boy was hit by the girl

transcribed the imitation tasks and scored them independently. The reliability for MLU's between primary investigator and the two students was 86% and 94% agreement. The original calculation of MLU by the investigator was used for the analysis. The same procedure was followed with the imitation task. The reliability between primary investigator and the two students was 80% and 96% of agreement.

Statistical Design

In order to confirm or reject the five major hypotheses described in Chapter 4, the data were analyzed as a Split Plot Factorial Design (Kirk, 1968, p. 308-311). MLU scores defined the between groups factor, representing Stage I, II, IIIa, b, and c of linguistic development. Within factors were: Context (2 levels), Syntactic Constructions (4 levels) and Semantic Relations (4 levels). The four main effects defined in Chapter 4--Language Stage, Context/Non-Context, Syntactic Constructions, and Semantic Relations--were tested, and all the inter actions among these four main effects were tested. Furthermore, a priori orthogonal contrasts had been formulated and were tested. Table 16 summarizes the four main effects with all interactions and a priori contrasts. The criterion variables were accuracy scores for Semantic Relations and Syntactic Constructions for each of the stimulus sentences.

The maximum indication of significance for this study was set at .05 level as representing a reasonable risk of Type I errors.

In summary, twenty children were participating in an imitative experiment. Upon completion of 50 consecutive, intelligible, nonimitative utterances in a free-play interaction with the teacher or speech therapist,

Table 16

Summary Table of the Four Main Effects and the Interactions

Four Main Effects and the Interactions		*a priori* Orthogonal Contrasts
H_1:	Stage	
H_2:	Context	
	Context by Syntax	3
	Context by Semantics	3
	Context by Stage	
	Context by Syntax by Stage	12
	Context by Semantics by Syntax	9
	Context by Semantics by Stage	
	Context by Semantics by Syntax by Stage	
H_3:	Syntax	3
	Syntax by Stage	
H_4:	Semantics	3
	Semantics by Stage	
H_5:	Semantics by Syntax	9
	Semantics by Syntax by Stage	

each child was presented with 64 stimulus sentences in an elicited imitation task. There were two presentation conditions of 32 stimulus sentences each, including four Semantic Relations (Agent-Action, Action-Object, Possessive, Locative) occurring twice in each of four Syntactic Constructions (Simple Active Affirmative Declarative, Inversion Interrogative, Embedded and Passive). The order of presentation conditions and also the order of presenting the stimlus sentences were randomized. Each child was tested individually. The results of the analysis are described in the following chapter.

CHAPTER 6

RESULTS

The purpose of this study was to investigate the elicited imitation performance of echolalic "autistic" children who were at Stage I, Stage II, and Stage III level of linguistic development. Twenty children participated in the study, four in each of five groups: (1) Stage I, (2) Stage II, (3) Stage IIIa (MLU 2.8 to 2.9), (4) Stage IIIb (MLU 3.0 to 3.2), and (5) Stage IIIc (MLU 3.3 to 3.5). Each child was asked to imitate 64 stimuli sentences representing combinations of semantic, syntactic characteristics under Context and Non-Context conditions.

The data were analyzed as a fixed effects Split Plot Factorial multivariate analysis of variance (Kirk, 1968, pp. 308-311). MLU scores defined the between-groups factor, representing Stages I, II, and IIIa, b, and c of linguistic development. The five levels of Stage were computed on the basis of pre-experimental training session data. Within subjects factors were: Semantic Relations (4 levels), Syntactic Constructions (4 levels), and Context (2 levels).

The criterion variables were accuracy scores for Semantic Relations and for Syntactic Constructions for each of the stimuli sentences. The 64 items were divided into two sets of 32 items, one of which was presented with context and the other was presented without context. Each group of 32 sentences was divided between four Semantic Relations and each Semantic Relation was divided between four Syntactic Constructions. The scores used in the analysis were sums of these two attempts for each combination of Semantic Relations, Syntactic Constructions, and Context Levels.

The Split Plot Factorial MANOVA was completed by the CDC6600/CYBER172 at Indiana University, using the MULTIVARIANCE IV Computer Program (Finn, 1968). The Statistical Package for Social Sciences (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975) was used for supplementary data analysis. The MANOVA results are presented in Table 17. Additional information relative to this analysis is summarized in Appendix C.

For convenience of presentation, the results have been organized to conform with the study's hypotheses (Chapter 4). However, each statistical hypothesis in the present chapter is stated in the null form.

HYPOTHESIS 1: Elicited imitation performance of echolalic "autistic" children does not differ as a function of their linguistic development Stage as indexed by MLU.

The means for Semantic and Syntactic Accuracy for each of the five groups are presented in Table 18. (For convenience a key of abbreviations is presented for reading the subsequent tables.) The results of the MANOVA (Table 17) revealed no statistically significant differences between Stage I, II, IIIa, IIIb, and IIIc on the two criterion variables. Hence, the null hypothesis could not be rejected. The sample mean vectors for the five levels of this factor are graphically presented in Figure 1.

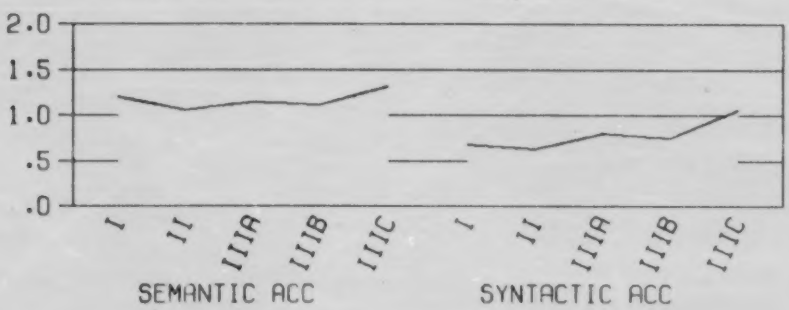

Figure 1. Mean Accuracy Scores By Stage

Table 17

Summary Table of Split Plot Factorial

Multivariate Analysis of Variance (MANOVA)

Source of Variation	df	F ratio	Probability Level
Between Groups			
H_1: Stage	8,28	0.51	.84
Within Groups			
H_2: Context	2,14	8.36	.01*
Context by Syntax	6,88	2.27	.04*
Context by Semantics	6,88	2.51	.03*
Context by Stage	8,28	1.77	.13*
Context by Syntax by Stage	24,88	1.94	.01*
Context by Semantics by Syntax	18,268	2.34	.01*
Context by Semantics by Stage	24,88	1.34	.17
Context by Semantics by Syntax by Stage	72,268	1.15	.21
H_3: Syntax	6,88	7.35	.01*
Syntax by Stage	24,88	0.89	.61
H_4: Semantics	6,88	17.19	.01*
Semantics by Stage	24,88	0.72	.12
H_5: Semantics by Syntax	18,268	4.56	.01*
Semantics by Syntax by Stage	72,268	1.13	.25

*$p < .05$

Key of Abbreviations

A-A	Agent-Action
A-O	Action-Object
EMB	Embedded
INV INT	Inversion Interrogative
LOC	Locative
MLU	Mean Length of Utterance
PASS	Passive
POSS	Possessive
SAAD	Simple Active Affirmative Declarative
SDFC	Standardized Discriminant Function Coefficient

Table 18

Accuracy Mean Vectors for Main Effects of MANOVA

Factors	Semantic Accuracy	Syntactic Accuracy
1. Language Stage		
I	1.20	0.68
II	1.06	0.63
IIIa	1.14	0.80
IIIb	1.12	0.76
IIIc	1.32	1.16
2. Semantic Relations		
A-A	1.16	0.71
A-O	1.19	0.99
POSS	0.76	0.68
LOC	1.56	0.77
3. Syntactic Constructions		
SAAD	1.16	0.98
INV INT	1.07	0.75
EMB	1.20	0.43
PASS	1.24	0.99
4. Contextual Types		
Context	1.25	0.82
Non-Context	1.08	0.75

HYPOTHESIS 2: Elicited imitation performance of echolalic "autistic" children does not differ as a function of the presence or absence of external nonlinguistic contextual support.

The means for Semantic and Syntactic Accuracy for Context and Non-Context conditions are presented in Table 18. This main effect is graphically presented in Figure 2.

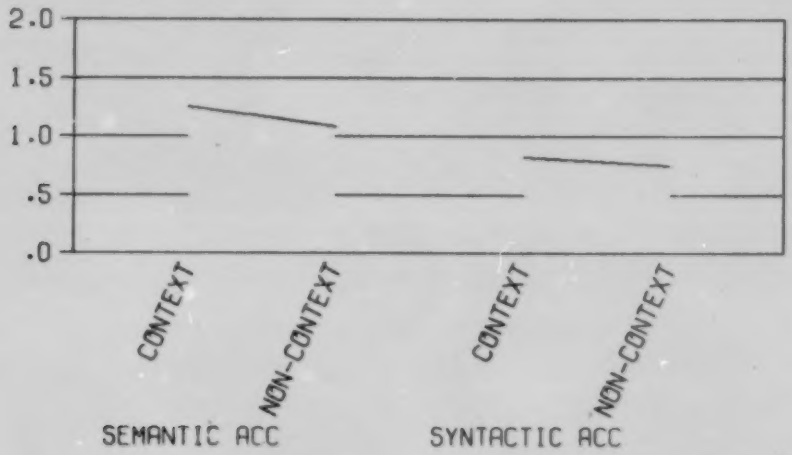

Figure 2. Mean Accuracy Scores By Context and Non-Context.

Given an F ratio of 8.36 with 2 and 14 degress of freedom, the null hypothesis was rejected at the pre-specified alpha level of $< .05$.

The multivariate question still remained whether one or the other or both dependent variables had contributed to this difference. Multiple discriminant function analysis was used to answer this question. The Standardized Discriminant Function Coefficient (SDFC) for Semantic Accuracy was 0.87. The SDFC for Syntactic Accuracy was .02. Hence, the statistically significant difference between Context and Non-Context levels was due mainly to higher Semantic Accuracy means for the Context condition.

Contextual Level-by-Syntactic Level

The means of Semantic and Syntactic Accuracy for the two contextual types (Context and Non-Context) and for the four different Syntactic Constructions are summarized in Table 19.

Table 19

Accuracy Means of Syntactic Constructions by Contextual Types

Syntactic Constructions	Context		Non-Context	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD	1.34	1.08	0.98	0.88
INV INT	1.20	0.74	0.94	0.76
EMB	1.23	0.49	1.16	0.36
PASS	1.24	0.99	1.25	1.00

The null hypothesis states that accuracy differences between Context and Non-Context factor are the same in the four levels of the Syntactic Constructions factor in the population. The analysis yielded an F ratio of 2.27 with 6 and 88 degrees of freedom. Consequently, the null hypothesis was rejected ($p < .05$). This interaction is presented graphically in Figure 3.

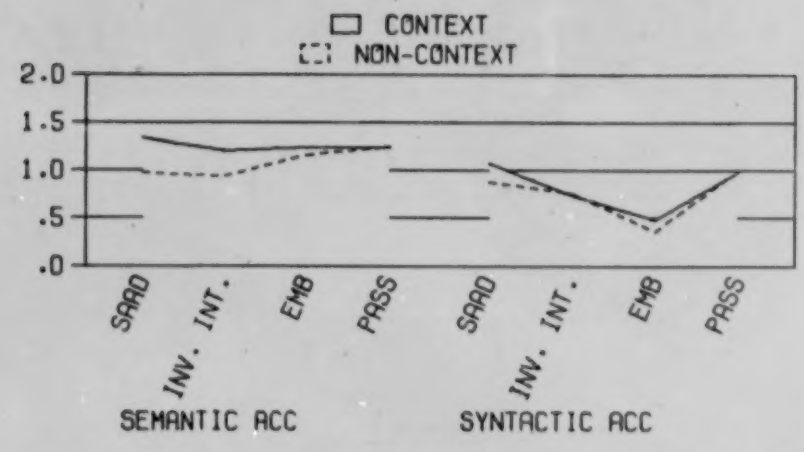

Figure 3. Mean Accuracy Scores for Contextual Levels by Syntactic Levels

Given a statistically significant interaction effect for Context and Non-Context by Syntactic Constructions, three orthogonal planned comparisons were tested. The results are presented in Table 20.

Table 20

Summary Table of

a priori Orthogonal Contrasts:

Context/Non-Context by Syntactic Constructions Factor

Source of Variation	df	F ratio	Probability Level
Context vs. Non-Context by SAAD vs. INV INT	2,44	1.66	.20
Context vs. Non-Context by EMB vs. PASS	2,44	0.63	.53
Context vs. Non-Context by SAAD and INV INT combined vs. EMB and PASS combined	2,44	4.59	.01*

*p < .05

The first comparison was a test of the interaction between Context/Non-Context conditions and SAAD vs. INV INT (see Table 19 for mean vectors). The null subhypothesis was not rejected at the .05 level.

The second comparison tested the equality of Context/Non-Context differences vectors at EMB and at PASS (see Table 19). Given the insignificant F ratio, the null subhypothesis was not rejected.

The third comparison tested the equality of the Context/Non-Context difference vector at early evolving (SAAD and INV INT) and the later evolving (EMB and PASS) Syntactic Constructions. The null subhypothesis was rejected ($p < .01$). The combined means for Context and Non-Context by the Syntactic Constructions factor are presented in Table 21.

Table 21

Combined Means for

Context/Non-Context by Syntactic Constructions Factor

Combined Syntactic Constructions	Context		Non-Context	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD and INV INT	1.27	0.91	0.96	0.82
EMB and PASS	1.24	0.74	1.21	0.68

The presence of Context was characterized by a higher Semantic Accuracy score in the early evolving Syntactic Constructions. Context appeared to contribute only a small difference over Non-Context in the Syntactic Accuracy

score for the early evolving Syntactic Constructions. The difference vector for this contrast was ([.31 .09]). In contrast, neither accuracy variable appeared to be much higher in the Context condition over the Non-Context condition in the later evolving Syntactic Constructions. The different vector for this contrast was ([.04 .06]). The discriminant analysis supported this interpretation of the sample mean vectors. The SDFCs for this contrast were ([.80 .35]).

Contextual Level-by-Semantic Level

The means of Semantic and Syntactic Accuracy for the four Semantic Relations by the two contextual types are summarized in Table 22.

Table 22

Accuracy Means of Semantic Relations by Contextual Types

Semantic Relations	Context		Non-Context	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
A-A	1.28	0.08	1.05	0.63
A-O	1.35	1.14	1.03	0.84
POSS	0.73	0.55	0.80	0.80
LOC	1.66	0.80	1.45	0.74

The null hypothesis states that accuracy differences between Context and Non-Context are the same at each of the four levels of

the Semantic Relations factor in the population. This interaction is presented graphically in Figure 4.

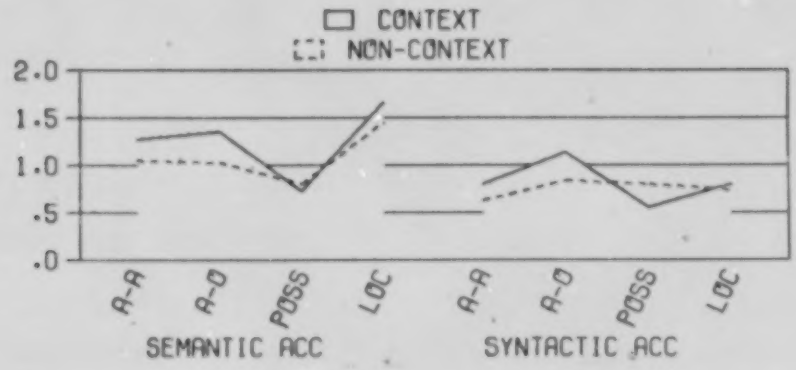

Figure 4. Mean Accuracy Scores by Context by Semantic Relations Level

The analysis revealed an F ratio of 2.51 with 6 and 88 degrees of freedom, therefore the null hypothesis was rejected ($p < .05$). Because the analysis revealed a significant interaction effect, it was appropriate to further examine this effect. Three orthogonal a priori planned compari- were tested. The results are presented in Table 23.

Table 23

Summary Table of

a priori Orthogonal Contrasts:

Context/Non-Context by Semantic Relations Factor

Source of Variation	df	F ratio	Probability Level
Context vs. Non-Context by A-A vs. A-O	2,44	0.40	.67
Context vs. Non-Context by POSS vs. LOC	2,44	2.94	.06
Context vs. Non-Context by A-A and A-O combined vs. POSS and LOC combined	2,44	4.72	.01*

*$p < .05$

The first contrast represented the test of mean vector differences between the Context and Non-Context in A-A compared to A-O (see Table 23 for mean vectors). The null subhypothesis could not be rejected for this contrast.

The second contrast compared the mean vector differences between the Context and Non-Context in POSS compared to LOC (see Table 23 for mean vectors). The analysis yielded an F ratio of 2.94 with 2 and 44 degrees of freedom which approached, but did not exceed, the critical alpha level (.05) for rejecting the null subhypothesis.

The mean vectors for the third contrast, testing the difference between A-A and A-O combined vs. POSS and LOC combined on the Context and Non-Context difference vector, are presented in Table 24.

Table 24

Combined Means for

Context/Non-Context by Semantic Relations Factor

Combined Semantic Relations	Context		Non-Context	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
A-A and A-O	1.31	0.97	1.04	0.73
POSS and LOC	1.19	0.68	1.13	0.77

There were sizeable differences in both variables in this interaction contrast. Both variables were higher when Context was present for A-A and A-O levels combined. The difference vector in favor of

Context was ([.27 .24]). This Context advantage was not present for combined POSS and LOC levels. The comparable difference vector was ([.06 -.09]). The discriminant analysis weighted the Syntactic Accuracy score higher for this effect (SDFC = [.22 .84]).

Contextual Level-by-Stage

The means representing Context and Non-Context differences by Stage are presented in Table 25.

Table 25

Accuracy Means by Language Stage by Contextual Type

Stage	Context		Non-Context	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
I	1.34	0.63	1.06	0.73
II	1.19	0.67	0.92	0.59
IIIa	1.25	0.95	1.03	0.66
IIIb	1.14	0.83	1.09	0.69
IIIc	1.34	1.03	1.30	1.08

The null hypothesis states that the difference vectors between Context and Non-Context levels are identical in each of the five levels of Language Stage in the population. The F ratio of 1.77 with 8 and 28 degrees of freedom led to the conclusion that no interaction effects existed between Language Stage and Contextual Types in the population of echolalic "autistic" children.

Contextual Level-by-Syntactic Level-by-Stage

The means representing Context and Non-Context conditions by the Syntactic Constructions (4 levels) by Stage are summarized in Table 26. The null hypothesis states that accuracy differences under Context and Non-Context conditions at the four levels of Syntactic Constructions differ identically at each level of the Language Stage factor in the population. The F ratio of 1.94 with 24 and 88 degrees of freedom reached statistical significance beyond the .05 level, therefore, the null hypothesis was rejected. This interaction is presented graphically in Figure 5.

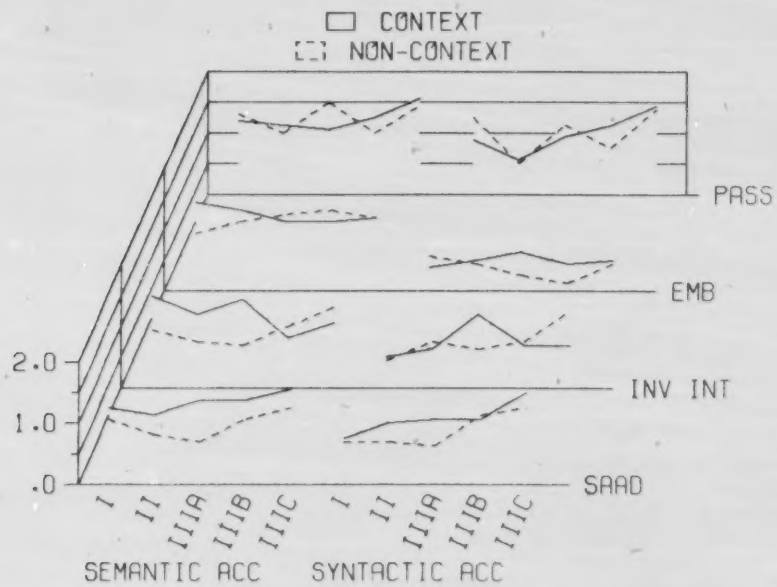

Figure 5. Mean Accuracy Scores by Syntax by Stage by Context.

Twelve orthogonal comparisons were tested to further analyze the interaction effects. Table 27 presents the results of these tests.

Table 26

Accuracy Means of Context/Non-Context Conditions by Syntactic Constructions Factor by Stage

Stage	Syntactic Constructions	Context		Non-Context	
		Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
I	SAAD	1.25	.75	1.06	.69
II		1.13	1.00	.81	.69
IIIa		1.38	1.06	.69	.63
IIIb		1.38	1.06	1.06	1.13
IIIc		1.56	1.50	1.25	1.25
I	INV INT	1.50	.50	.94	.44
II		1.19	.63	.75	.75
IIIa		1.44	1.19	.69	.63
IIIb		.81	.69	1.00	.75
IIIc		1.06	.69	1.31	1.25
I	EMB	1.44	.38	.94	.56
II		1.31	.50	1.13	.44
IIIa		1.13	.63	1.25	.25
IIIb		1.13	.44	1.31	.73
IIIc		1.19	.50	1.19	.44
I	PASS	1.19	.88	1.31	1.25
II		1.13	.56	1.00	.50
IIIa		1.06	.94	1.50	1.13
IIIb		1.25	1.13	1.00	.75
IIIc		1.56	1.44	1.44	1.38

Table 27

Summary Table of

a priori Orthogonal Contrasts:

Context/Non-Context by Syntactic Constructions Factor by Stage

Source of Variation	df	F Ratio	Probability Level
(1) Context/Non-Context by SAAD vs. INV INT by Stage I vs. Stage II	2,44	0.63	.54
(2) Context/Non-Context by EMB vs. PASS by Stage I vs. Stage II	2,44	0.44	.83
(3) Context/Non-Context by SAAD and INV INT combined vs. EMB and PASS combined by Stage I vs. Stage II	2,44	0.85	.43
(4) Context/Non-Context by SAAD vs. INV INT by Stage I and II vs. Stage III	2,44	2.56	.08
(5) Context/Non-Context by EMB vs. PASS by Stage I and II vs. Stage III	2,44	1.69	.20
(6) Context/Non-Context by SAAD and INV INT combined vs. EMB and PASS combined by Stage I and II vs. Stage III	2,44	2.07	.14
(7) Context/Non-Context by SAAD vs. INV INT by Stage IIIa vs. Stage IIIb	2,44	0.86	.43
(8) Context/Non-Context by EMB vs. PASS by Stage IIIa vs. Stage IIIb	2,44	1.92	.16
(9) Context/Non-Context by SAAD and INV INT combined vs. EMB and PASS combined by Stage IIIa vs. Stage IIIb	2,44	6.46	.01*
(10) Context/Non-Context by SAAD vs. INV INT by Stage IIIa and IIIb vs. Stage IIIc	2,44	3.37	.04*
(11) Context/Non-Context by EMB vs. PASS by Stage IIIa and IIIb vs. Stage IIIc	2,44	0.29	.75
(12) Context/Non-Context by SAAD and INV INT combined vs. EMB and PASS combined by Stage IIIa and IIIb vs. Stage IIIc	2,44	2.08	.14

*$p < .05$

The differences in the Context/Non-Context difference vectors for accuracy for early evolving (SAAD and INV INT combined) vs. later evolving (EMB and PASS combined) Syntactic Constructions in Stage IIIa vs. Stage IIIb (see Table 25) were tested. The F ratio reached statistical significance beyond the .05 level (see Table 26), hence the null sub-hypothesis was rejected. The combined mean vectors for this interaction are presented in Table 28.

Table 28

Combined Means for Context/Non-Context

by Syntactic Constructions Factor by Stage

Combined Means for Syntactic Constructions by Stage	Context		Non-Context	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD and INV INT combined in Stage IIIa	1.41	1.13	0.69	0.62
EMB and PASS combined in Stage IIIa	1.10	0.78	1.38	0.69
SAAD and INV INT combined in Stage IIIb	1.10	0.88	1.03	0.94
EMB and PASS combined in Stage IIIb	1.19	0.78	1.16	0.44

The difference vectors used in the interpretation of this interaction are presented in Table 29.

Table 29

Context/Non-Context Difference Vectors by Early Evolving (SAAD and INV INT combined) vs. Late Evolving (EMB and PASS combined) Syntactic Constructions by Stage IIIa and Stage IIIb

Stage	Early Evolving Syntactic Constructions		Later Evolving Syntactic Constructions		Difference Vector	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
IIIa	.72	.50	-.28	.10	1.00	.40
IIIb	.07	-.07	.04	.35	.03	-.42
	.65	.57	-.32	-.25	.97	.82

Examination of the mean vectors for this interaction contrast revealed that when Context was present, higher accuracy scores for both variables existed in the early evolving Syntactic Constructions compared to the later evolving constructions in Stage IIIa. There was no such Context advantage for Stage IIIb. The mean difference vector between IIIa and IIIb at early evolving Syntactic Constructions was ([.65 .57]).

In contrast, Context did not appear to support higher accuracy scores for the later evolving Syntactic Constructions for Stage IIIa over Stage IIIb. The mean difference vector was ([-.32 -.25]). Discriminant analysis supported the previous discussion of the examination of the means for this contrast. Both of the accuracy variables were important in this interaction (SDFC were ([.64 .55]).

The difference between Context/Non-Context difference vectors for SAAD vs. INV INT in Stage IIIa and IIIb combined vs. Stage IIIc (see Table 26) were contrasted. It yielded statistical significance with an F ratio of 3.37 and 2 and 44 degrees of freedom. Hence, the null subhypothesis was rejected. The combined means for this interaction are presented in Table 30.

Table 30

Combined Means for Context/Non-Context by Syntactic Constructions Factor by Stage

Combined Means for Syntactic Constructions and Stage	Context		Non-Context	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD in Stage IIIa and Stage IIIb	1.38	1.06	0.88	0.88
INV INT in Stage IIIa and Stage IIIb	1.13	0.91	0.85	0.69
SAAD in Stage IIIc	1.56	1.50	1.25	1.25
INV INT in Stage IIIc	1.06	0.69	1.31	1.25

In order to further determine the interaction effect the difference vectors are presented in Table 31.

Table 31

Context/Non-Context Difference Vectors by

Stage IIIa and IIIb Combined vs. IIIc by SAAD vs. INV INT

Stage	SAAD		INV INT		Difference Vector	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
IIIa & IIIb combined	.50	.18	.28	.31	.23	-.13
IIIc	.31	.25	-.25	-.56	.56	.81
					-.33	-.94

When Context was present it supported higher accuracy scores for both variables for Stage IIIc in SAAD. The opposite was true for Stage IIIc at the INV INT level of Syntactic Constructions, particularly on the Syntactic Accuracy variable. This same SAAD-INV INT difference was not present in Stage IIIa and IIIb combined. Context appeared to support both types of accuracy at Stages IIIa and IIIb combined at both SAAD and at INV INT. The discriminant analysis supported the examination of the difference vectors mean for this contrast. The Syntactic Accuracy score had a higher weight in this contrast. The SDFC for this contrast was ([-.10 1.04]).

Contextual Level-by-Semantic Level-by-Syntactic Level

The mean vectors for Semantic and Syntactic Accuracy of the two Contextual Types (Context/Non-Context) for the four different Semantic Relations and the four different Syntactic Constructions are presented in Table 32.

The null hypothesis states that the Context and Non-Context difference varies across the levels of Semantic Relations identically at each of the four levels of Syntactic Constructions in the population. The analysis resulted in an F ratio of 2.34 with 18 and 268 degrees of freedom for this interaction. This result led to the decision to reject the null hypothesis of equality of mean vectors for Context/ Non-Context Semantic Relations by Syntactic Constructions. The interaction is presented graphically in Figure 6.

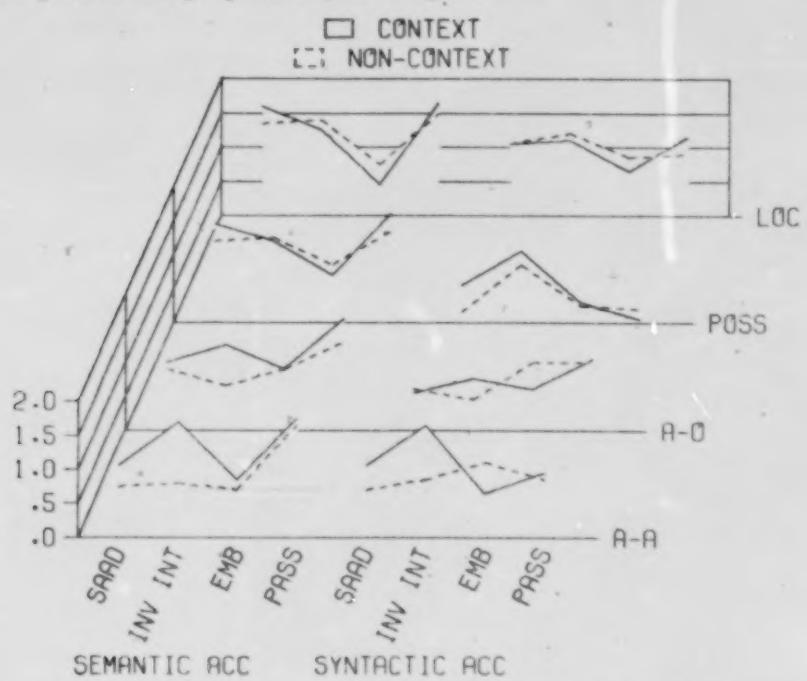

Figure 6. Mean Accuracy Scores by Semantics by Syntax by Context.

Table 32

Accuracy Means of Syntactic Constructions Factor

by Semantic Relations Factor by Contextual Types

Syntactic Constructions	Semantic Relations	Context		Non-Context	
		Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD	A-A	1.05	1.05	0.75	0.70
	A-O	1.70	1.65	0.80	0.85
	POSS	0.85	0.65	0.70	1.10
	LOC	1.75	0.95	1.65	0.85
INV INT	A-A	1.00	0.55	0.90	0.60
	A-O	1.25	0.75	0.65	0.45
	POSS	0.90	0.60	0.90	1.00
	LOC	1.65	1.05	1.30	1.00
EMB	A-A	1.45	0.55	1.20	0.15
	A-O	1.20	1.05	1.25	0.85
	POSS	0.70	0.30	0.85	0.25
	LOC	1.60	0.05	1.35	0.20
PASS	A-A	1.60	1.05	1.35	1.05
	A-O	1.25	1.10	1.40	1.20
	POSS	0.45	0.65	0.75	0.85
	LOC	1.65	1.15	1.50	0.50

Nine a priori orthogonal subhypotheses had been formulated and were subsequently tested (see Table 33).

Table 33

Summary Table of

A priori Orthogonal Contrasts

Context/Non-Context by Semantic Relations Factor

by Syntactic Constructions Factor

Source of Variation	df	F Ratio	Probability Level
(1) Context/Non-Context by A-A vs. A-O by SAAD vs. INV INT	2,134	.07	.94
(2) Context/Non-Context by POSS vs. LOC by SAAD vs. INV INT	2,134	1.07	.35
(3) Context/Non-Context by A-A and A-O combined by SAAD vs. INV INT	2,134	1.96	.15
(4) Context/Non-Context by A-A vs. A-O by EMB vs. PASS	2,134	0.14	.87
(5) Context/Non-Context by POSS vs. LOC by EMB vs. PASS	2,134	1.95	.15
(6) Context/Non-Context by A-A and A-O combined vs. POSS and LOC combined by EMB vs. PASS	2,134	2.06	.13
(7) Context/Non-Context by A-A vs. A-O by SAAD and INV INT combined vs. EMB and PASS combined	2,134	8.13	.01*
(8) Context/Non-Context by POSS vs. LOC by SAAD and INV INT combined vs. EMB and PASS combined	2,134	2.97	.05*
(9) Context/Non-Context by A-A and A-O combined vs. POSS and LOC combined by SAAD and INV INT combined vs. EMB and POSS combined	2,134	2.80	.06

*p < .05

Contrast (7), representing the Context/Non-Context difference in A-A vs. A-O in SAAD and INV INT combined vs. EMB and PASS combined, reached statistical significance with an F ratio of 8.13 and 2 and 134 degrees of freedom. The combined means are presented in Table 34.

Table 34

Combined Means for Context/Non-Context

by Semantic Relations Factor by Syntactic Constructions Factor

Combined Means	Context		Non-Context	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
A-A in SAAD and INV INT combined	1.03	0.80	0.83	0.65
A-O in SAAD and INV INT combined	1.48	1.20	0.73	0.65
A-A in EMB and PASS combined	1.53	0.80	1.28	0.60
A-O in EMB and PASS combined	1.23	1.08	1.33	1.03

For interpretation purposes, the mean difference vectors for Context/Non-Context factors are computed, and they are summarized in Table 35.

Table 35

Context/Non-Context Difference Vectors for A-A vs. A-O

by SAAD and INV INT Combined (Early Evolving)

by EMB and PASS Combined (Later Evolving)

Syntactic Constructions	Semantic Relations				Difference Vector	
	A-A		A-O			
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD and INV INT combined Early Evolving	.20	.15	.75	.55	-.55	-.40
EMB and PASS combined Later Evolving	.25	.20	-.10	.05	.35	.15
					-.90	-.55

For Semantic Relations A-O, Context supported much higher accuracy scores at early evolving Syntactic Constructions, but not at later constructions. For A-A, slightly higher accuracy scores are obtained equally for both levels of construction.

Discriminant analysis supported this interpretation of the mean vectors and assigned a large SDFC to Semantic Accuracy score ([1.74 .45]) in this contrast.

Contrast (8) compared the Context/Non-Context difference in POSS and LOC by SAAD and INV INT combined (early evolving) vs. EMB and PASS (later evolving). The F ratio for this contrast reached statistical significance at the .05 level. The combined means for this interaction are presented in Table 36.

Table 36

Combined Mean Vectors for Context/Non-Context by

Semantic Relations Factor by Syntactic Constructions Factor

Combined Means for Semantic Relations by Syntactic Constructions	Context		Non-Context	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
POSS in SAAD and INV INT combined	.88	.63	.80	1.05
LOC in SAAD and INV INT	1.70	1.00	1.48	.93
POSS in EMB and PASS combined	.58	.48	.80	.55
LOC in EMB and PASS combined	1.63	.55	1.43	.55

Further, the mean difference vectors for Context/Non-Context for this interaction are summarized in Table 37.

Table 37

Context/Non-Context Difference Vectors of POSS vs. LOC

by SAAD and INV INT Combined (Early Evolving) vs.

EMB and PASS Combined (Later Evolving) Syntactic Constructions

Syntactic Construction	Semantic Relations				Difference Vector	
	POSS		LOC			
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD and INV INT combined (Early Evolving)	.08	-.42	.22	.07	-.14	-.49
EMB and PASS combined (Later Evolving)	-.22	-.07	.20	0	-.42	-.07
					.28	-.42

A context disadvantage at both levels of Syntactic Constructions lies in the POSS Semantic Relation rather than LOC Relation. In early evolving Syntactic Constructions, this disadvantage lies in Syntactic Accuracy, while in later evolving Syntactic Constructions this disadvantage is less evident and occurs in Semantic Accuracy.

Discriminant analysis for this interaction assigned a higher weight to Syntactic Accuracy (SDFC = [.16 .93]).

Contextual Level-by-Semantic Level-by-Stage

The means of Semantic and Syntactic Accuracy for this interaction between Context and Non-Context levels and Semantic Relations (4 levels) and Language Stage (5 levels) are summarized in Table 38.

The null hypothesis states that accuracy differences between Context and Non-Context conditions vary identically in the four levels of Semantic Relations at each level of the Language Stage in the population. The F ratio of 1.34 with 24 and 88 degrees of freedom did not reach statistical significance, hence the null hypothesis could not be rejected.

Contextual Level-by-Semantic Level-by-Syntactic Level-by Stage

The null hypothesis states that Context and Non-Context differences across the four levels of Semantic Relations and the four Syntactic Constructions are identical in the population at each level of the Language Stage. The F ratio of 1.15 with 72 and 268 degrees of freedom was not statistically significant, therefore, the null hypothesis could not be rejected.

Table 38

Accuracy Means of

Context/Non-Context Conditions by Four Semantic Relations Factor by Stage

Stage	Semantic Relations	Context		Non-Context	
		Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
I	A-A	1.44	.63	1.06	.81
II		1.13	.63	.75	.44
IIIa		1.31	.94	.88	.31
IIIb		1.00	.69	1.31	.63
IIIc		1.50	1.13	1.25	.94
I	A-O	1.44	1.00	1.13	.94
II		1.31	.94	.69	.50
IIIa		1.13	1.13	1.19	.94
IIIb		1.50	1.44	.88	.69
IIIc		1.38	1.19	1.25	1.13
I	POSS	.75	.25	.75	.75
II		.75	.63	.63	.75
IIIa		.81	.81	.94	.75
IIIb		.50	.31	.63	.63
IIIc		.81	.75	1.06	1.13
I	LOC	1.75	.63	1.31	.44
II		1.56	.50	1.63	.69
IIIa		1.75	.94	1.13	.63
IIIb		1.56	.88	1.56	.81
IIIc		1.69	1.06	1.63	1.13

HYPOTHESIS 3: Elicited imitation performance of echolalic "autistic" children reveals no significant interaction between the Syntactic Constructions variations in the sentence stimuli.

The means of Syntactic Constructions are presented in Table 17. The main effect is graphically presented in Figure 7.

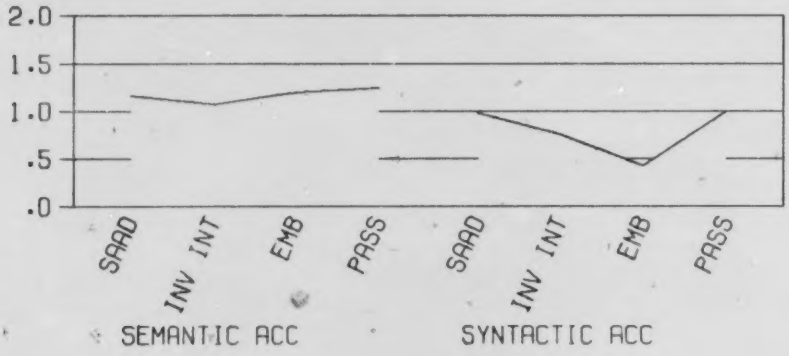

Figure 7. Mean Accuracy Scores by Syntactic Constructions

The analysis revealed an F ratio of 7.35 with 6 and 88 degrees of freedom for this factor. This result led to the decision to reject the null hypothesis of equality of mean accuracy vectors for the four levels of Syntactic Constructions. Consequently, it was important to look at the results of the three orthogonal a priori subhypotheses related to the differences in levels of the Syntactic Construction factor. The results are presented in Table 39.

Table 39

Summary Table of

a Priori Orthogonal Constrasts

Syntactic Constructions Factor

Source of Variation	df	F ratio	Probability Level
SAAD vs. INV INT	2,44	2.21	.12
EMB vs. PASS	2,44	16.78	.01*
SAAD and INV INT combined vs. EMB and PASS combined	2,44	6.50	.01*

* $p < .05$

The first contrast represented the difference between mean accuracy vectors under SAAD and INV INT levels (See Table 17). The F ratio was not large enough to reject the null hypothesis.

The second contrast represented the difference between EMB and PASS Constructions. See Table 19 for mean accuracy vectors. The F ratio was significant beyond the .05 level, therefore, the null subhypothesis was rejected. Both accuracy scores for PASS were higher than for EMB, although the discriminant analysis assigned a larger SDFC to the Syntactic Accuracy score ([0.45 1.13]).

The third a priori subhypothesis contrasted the early evolving SAAD and INV INT with the later evolving (EMB and PASS) Syntactic Constructions. These combined mean vectors for the Syntactic Constructions factor are presented in Table 40.

Table 40

Combined Means for Syntactic Constructions Factor

Combined Syntactic Constructions	Semantic Accuracy	Syntactic Accuracy
SAAD and INV INT	1.11	0.86
EMB and PASS	1.22	0.71

The F ratio for this contrast was statistically significant beyond the .05 level. The discriminant analysis concluded that the higher Syntactic Accuracy score characterized the earlier evolving Syntactic Constructions ([-0.01 1.00]).

Syntactic Level-by-Stage

The Syntactic Constructions mean vectors are crosstabulated in Table 41. The null hypothesis states that accuracy differences in the four levels of Syntactic Constructions are the same at each level of the Language Stage factor in the population. The F ratio of 0.89 with 24 and 88 degrees of freedom was not statistically significant at the .05 probability level, therefore, the null hpothesis was not rejected.

Table 41

Accuracy Means of Language Developmental Stage

by Syntactic Constructions Factor

Stage	Syntactic Construction	Semantic Accuracy	Syntactic Accuracy
I		1.16	0.72
II		0.97	0.84
IIIa	SAAD	1.03	0.84
IIIb		1.22	1.09
IIIc		1.41	1.38
I		1.22	0.47
II		0.97	0.69
IIIa	INV INT	1.06	0.91
IIIb		0.91	0.72
IIIc		1.19	0.97
I		1.19	0.47
II		1.22	0.47
IIIa	EMB	1.19	0.44
IIIb		1.22	0.28
IIIc		1.19	0.47
I		1.25	1.06
II		1.06	0.53
IIIa	PASS	1.28	1.03
IIIb		1.13	0.94
IIIc		1.50	1.41

HYPOTHESIS 4. Elicited imitation performance of echolalic "autistic" children does not differ as a function of the Semantic Relations variations in the sentence stimuli.

Means of Semantic and Syntactic Accuracy for each of the four levels of the Semantic Relations factor are presented in Table 19. The main effect is graphically presented in Figure 8.

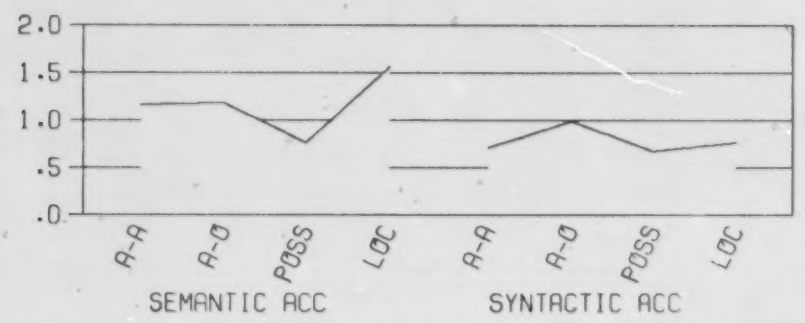

Figure 8. Mean Accuracy Scores by Semantic Relations

The analysis yielded an F ratio of 17.19 with 6 and 88 degrees of freedom. Hence, the null hypothesis was rejected at the $p < .001$ level. Given this statistically significant main effect, the question next was to determine which Semantic Relations level contributed to the overall difference. In anticipation of this question, three orthogonal a priori subhypotheses were formulated and tested as part of the extended analysis. The results of these tests are presented in Table 42.

Table 42

Summary Table of

a priori Orthogonal Contrasts

Semantic Relations Factor

Source of Variation	df	F ratio	Probability Level
A-A vs. A-O	2,44	7.33	.01*
POSS vs. LOC	2,44	48.58	.01*
A-A and A-O combined vs. POSS and LOC combined	2,44	3.14	.05*

*p ≤.05

The first *a priori* subhypothesis represented the contrast between the Semantic and Syntactic Accuracy mean vectors at the A-A level and the A-O level. Mean vectors for A-A and A-O are given in Table 18. The mean vectors for these two levels were different beyond the .05 probability level. The discriminant function analysis assigned a much higher SDFC to Syntactic Accuracy than to Semantic Accuracy in describing the difference between A-A and A-O relations (SDFC = [-0.28 1.06]). It can be concluded that the major difference between A-O condition and A-A condition is in higher Syntactic Accuracy means in the A-O level.

The second subhypothesis represented the contrast between mean vector the Semantic Relations levels POSS and LOC (see Table 18). The mean vectors for these two levels were different beyond the .05 level with an F ratio of 48.58 and 2 and 44 degrees of freedom (actual probability less than .000000001). While both accuracy scores were higher

for the LOC relation than for POSS relation, discriminant function analysis assigned a larger SDFC to Semantic Accuracy than to Syntactic Accuracy ([0.90 0.22]).

The third a priori contrast represented the Semantic Relations A-A and A-O combined versus POSS and LOC combined. The combined mean vectors for this a priori constrast are presented in Table 43.

Table 43

Combined Means for Semantic Relations Factor

Combined Semantic Relations	Semantic Accuracy	Syntactic Accuracy
A-A and A-O combined	1.18	0.85
POSS and LOC combined	1.16	1.44

The F ratio for this contrast was statistically significant at the .05 level. The discriminant analysis led to the conclusion that the Semantic Relations A-A and A-O combined differ from POSS and LOC combined mainly due to the higher Syntactic Accuracy scores for POSS and LOC relations (SDFC = [-0.25 1.06]).

Semantic Level-by-Stage

The means for Semantic and Syntactic Accuracy differences for each of the four Semantic Relations in each Stage are presented in Table 44. The null hypothesis states that accuracy differences between levels of the Semantic Relations factor are the same at each level of the Language Stage factor. The F ratio of 0.72 with 24 and 88 degrees of freedom

Table 44

Accuracy Means by Language Developmental Stage

by Semantic Relations Factor

Stage	Semantic Relations	Semantic Accuracy	Syntactic Accuracy
I		1.25	0.72
II		0.94	0.53
IIIa	A-A	1.09	0.63
IIIb		1.16	0.66
IIIc		1.38	1.03
I		1.28	0.97
II		1.00	0.72
IIIa	A-O	1.16	1.03
IIIb		1.19	1.06
IIIc		1.31	1.16
I		0.75	0.50
II		0.69	0.69
IIIa	POSS	0.88	0.78
IIIb		0.56	0.47
IIIc		0.94	0.94
I		1.53	0.53
II		1.59	0.59
IIIa	LOC	1.44	0.78
IIIb		1.56	0.84
IIIc		1.66	1.09

failed to reach the pre-specified significance level. The null hypothesis of no interaction effects between Semantic Relations and Stage among the sample of echolalic "autistic" children was not rejected.

HYPOTHESIS 5: Elicited imitation performance of echolalic "autistic" children reveals no significant interaction between the four Semantic Relations and the four Syntactic Constructions.

The means of Semantic and Syntactic Accuracy for the four different Semantic Relations and for the four different Syntactic Constructions are summarized in Table 45.

The null hypothesis states that the mean differences which exist across the four levels of the Semantic Relations factor are identical in the four levels of Syntactic Constructions in the population. The analysis revealed an F ratio of 4.56 with 18 and 268 degrees of freedom for this interaction. This result led to the decision to reject the null hypothesis. The interaction is presented graphically in Figure 9.

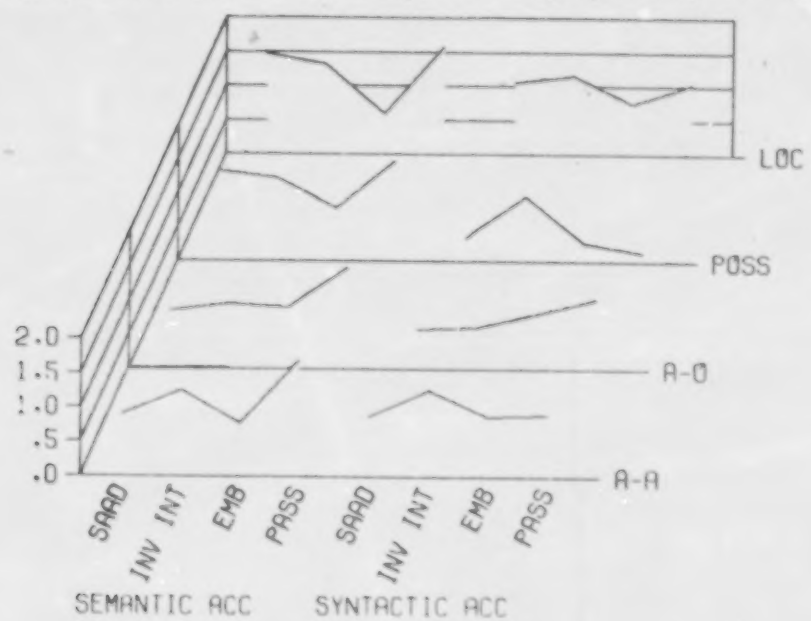

Figure 9. Mean Accuracy Scores by Semantics by Syntax

Table 45

. Accuracy Means of Semantic Relations Factor by Syntactic Constructions

Syntactic Constructions	Semantic Relations	Semantic Accuracy	Syntactic Accuracy
SAAD	A-A	0.90	0.88
	A-O	1.25	1.25
	POSS	0.78	0.88
	LOC	1.70	0.90
INV INT	A-A	0.85	0.58
	A-O	0.95	0.60
	POSS	0.90	0.80
	LOC	1.48	1.03
EMB	A-A	1.33	0.35
	A-O	1.23	0.95
	POSS	0.78	0.28
	LOC	1.48	0.13
PASS	A-A	1.48	1.05
	A-O	1.33	1.15
	POSS	0.60	0.75
	LOC	1.58	1.03

Accordingly, nine orthogonal a priori subhypotheses were tested (see Table 46).

Table 46

Summary Table of

a priori Orthogonal Constrasts:

Semantic Relations Factor by Syntactic Constructions Factor

Source of Variation	df	F ratio	Probability Level
(1) A-A vs. A-O by SAAD vs. INV INT	2,134	2.04	.13
(2) POSS vs. LOC by SAAD vs. INV INT	2,134	3.67	.03*
(3) A-A and A-O combined vs. POSS and LOC combined by SAAD vs. INV INT	2,134	8.08	.01*
(4) A-A vs. A-O by EMB vs. PASS	2,134	4.20	.02*
(5) POSS vs. LOC by EMB vs. PASS	2,134	2.51	.09
(6) A-A and A-O combined vs. POSS and LOC combined by EMB vs. PASS	2,134	4.10	.02*
(7) A-A vs. A-O by SAAD and INV INT combined vs. EMB and PASS combined	2,134	4.93	.008*
(8) POSS vs. LOC by SAAD and INV INT combined vs. EMB and PASS combined	2,134	0.55	.58
(9) A-A and A-O combined vs. POSS and LOC combined by SAAD and INV INT combined vs. EMB and PASS combined	2,134	11.56	.01*

*$p < .05$

The difference between mean accuracy vectors for POSS vs. LOC by SAAD vs. INV INT (see Table 46) was compared. This test reached statistical significance (see Table 46), therefore, the interaction was further analyzed. The mean difference vectors for this interaction are calculated in Table 47.

Table 47

Mean Vectors for POSS vs. LOC by SAAD vs. INV INT

Syntactic Construction	POSS		LOC		Difference Vector	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD	.78	.88	1.70	.90	-.92	-.02
INV INT	.90	.80	1.48	1.03	-.58	-.23
					-.34	.21

The LOC relation was higher than the POSS relation for the Semantic Accuracy variable in both Syntactic Constructions. This difference was larger in SAAD than in INV INT. The discriminant analysis placed a higher weight on the Syntactic Accuracy variable for this contrast. SDFC was ([.15 .92]).

Contrast (3) assessed the difference between accuracy vectors for A-A and A-O combined vs. POSS and LOC combined at SAAD and at INV INT. The contrast was statistically significant (see Table 46), therefore, the null subhypothesis was rejected. The mean vectors are presented and difference vectors are calculated in Table 48.

Table 48

Mean Vectors for A-A and A-O Combined

vs. POSS and LOC Combined by SAAD vs. INV INT

Syntactic Construction	A-A and A-O		POSS and LOC		Difference Vector	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD	1.08	1.07	1.24	.89	-.16	.18
INV INT	.60	.59	1.19	.91	-.59	-.32
					.43	.50

For both accuracy scores the children did better on POSS and LOC Relation than on A-A and A-O Relation under INV INT. This difference was not evident in SAAD Syntactic Construction.

Discriminant analysis yielded the SDFCs ([-.44 1.14]), placing a higher weight on Syntactic Accuracy for this interaction contrast.

Contrast (4) compared the difference between accuracy vectors for A-A vs. A-O at EMB vs. PASS. The test was statistically significant (see Table 46), therefore, the null subhypothesis was rejected. The mean vectors and difference vectors for this interaction are presented in Table 49 for further interpretation.

Table 49

Mean Vectors for A-A vs. A-O by EMB vs. PASS

Syntactic Construction	A-A		A-O		Difference Vector	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
EMB	1.33	.35	1.23	.95	.10	-.65
PASS	1.48	1.05	1.35	1.15	.15	-.10
					-.05	-.55

Syntactic Accuracy scores for A-O are higher than for A-A in EMB Syntactic Construction. This is not true for PASS Syntactic Construction. This difference is due primarily to the fact that Syntactic Accuracy is particularly low in A-A in the EMB Construction. Discriminant analysis supported this interpretation by assigning a higher SDFC ([-.49 1.15]) to the Syntactic Accuracy score.

The difference between accuracy vectors for A-A and A-O combined vs. POSS and LOC combined by EMB vs. PASS was tested. This contrast reached statistical significance (see (6), Table 46), hence, the null subhypothesis was rejected. The mean vectors and difference vectors for this interaction are presented in Table 50.

Table 50

Mean Vectors for A-A and A-O Combined vs.

POSS and LOC Combined by EMB vs. PASS

Syntactic Construction	A-A and A-O		POSS and LOC		Difference Vector	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
EMB	1.28	.65	1.13	.20	.15	.45
PASS	1.41	1.10	1.09	.89	.32	.21
					-.17	.14

Comparing A-A and A-O combined vs. POSS and LOC combined, the difference lies primarily in the considerably lower Syntactic Accuracy scores in the EMB Syntactic Construction for the POSS and LOC Semantic Relations. Children had difficulties in maintaining the POSS and LOC Relations generally. In the EMB Construction, the difference is in Syntactic Accuracy, while for the POSS Construction, the difference is in Semantic Accuracy. The discriminant analysis placed a higher SDFC on Syntactic Accuracy (SDFC = $[-.15\ 1.07]$).

The difference between accuracy vectors for A-A vs. A-O in early evolving (SAAD and INV INT combined) vs. later evolving (EMB and PASS combined) Syntactic Constructions was tested. This contrast was statistically significant (see (7), Table 46), therefore, the null subhypothesis was rejected. The mean vectors and difference vectors for this interaction are presented in Table 51.

Table 51

Mean Vectors for A-A vs.

A-O by SAAD and INV INT Combined vs. EMB and PASS Combined

Syntactic Construction	A-A		A-O		Difference Vector	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD and INV INT	.88	.73	1.10	.93	-.12	-.20
EMB and PASS	1.41	.70	1.09	1.10	.32	-.40
					-.44	.20

Although children are more accurate on both variables in A-O than in A-A Semantic Relations factor for early evolving Syntactic Constructions, this is true only for Syntactic Accuracy in the later evolving Syntactic Construction. The discriminant analysis placed the highest weight on Syntactic Accuracy in the post hoc examination of this interaction contrast (S_{DPC} = [.19 .89]).

The final contrast compared the difference between accuracy vectors for A-A and A-O combined vs. POSS and LOC combined at early evolving (SAAD and INV INT combined) and at later evolving (EMB and PASS combined) Syntactic Constructions. The contrast was statistically significant (see Table 46), therefore, the null subhypothesis was rejected. The mean vectors and difference vectors for this interaction are presented in Table 52.

Table 52

Mean Vectors for A-A and A-O Combined vs. POSS and LOC Combined by SAAD and INV INT Combined (Early Evolving) vs. EMB and PASS Combined (Later Evolving)

Syntactic Construction	A-A and A-O		POSS and LOC		Difference Vector	
	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy	Semantic Accuracy	Syntactic Accuracy
SAAD and INV INT	.99	.83	1.22	.90	-.23	-.07
EMB and PASS	1.34	.88	1.11	.55	.23	.33
					-.46	-.40

For the early evolving Syntactic Constructions, A-A and A-O Semantic Relations combined had lower Semantic Accuracy scores than the POSS and LOC Relations. The opposite was true in later evolving Syntactic Constructions. Here A-A and A-O Semantic Relations were higher than POSS and LOC on both accuracy variables. The discriminant analysis weighted both variables approximately equally in testing the difference vectors of this contrast ($[.53\ .62]$).

Semantic Level-by-Syntactic Level-by-Stage

The null hypothesis states that accuracy differences in the four levels of Semantic Relations and the four levels of Syntactic Constructions are identical at each level of Language Stage in the population. The analysis yielded an F ratio of 1.13 with 72 and 268 degrees of freedom, hence, the null hypothesis was not rejected.

Summary

This chapter has presented the results of the statistical analysis of the data from the study. Table 53 summarizes the major findings in relation to hypotheses. The following chapter discusses these results and presents implications for research, theory, and language training.

Table 53

Summary of Results

Major Hypotheses	Significant Subhypotheses	Test	F	Significance	Findings
H_1: Stage		MANOVA	0.51	NS	No support for H_1 Accepted null hypothesis
H_2: Context		MANOVA	8.36	.01	Supports H_2. Context > Non-Context Sem. Acc. > Synt. Acc.
	Context by Syntax	MANOVA	2.27	.04	
	SAAD + INV INT combined vs. EMB + PASS combined	Planned Comparison	4.59	.01	SAAD + INV INT > EMB + PASS Sem. Acc. > Synt. Acc. for SAAD + INV INT combined for context
	Context by Semantics	MANOVA	2.51	.03	
	A-A + A-O combined vs. POSS + LOC combined	Planned Comparison	4.72	.01	A-A + A-O > POSS + LOC for both Acc. Scores in A-A + A-O for context
	Context by Syntax by Stage	MANOVA	1.94	.01	
	SAAD + INV INT combined vs. EMB + PASS combined by Stage IIIa vs. Stage IIIb	Planned Comparison	6.46	.01	SAAD + INV INT > EMB + PASS for both Acc. scores in Stage IIIa. No context advantage in IIIb.
	SAAD vs. INV INT by Stage IIIa + IIIb combined vs. Stage IIIc	Planned Comparison	3.37	.04	SAAD > INV INT for both Acc. scores in Stage IIIc. Negative Synt. Acc. for INV INT in Stage IIIc. SAAD > INV INT for both Acc, scores in Stage IIIa + Stage IIIb combined

Summary of Results

Major Hypotheses	Significant Subhypotheses	Test	F	Significance	Findings
	Context by Semantics by Syntax	MANOVA	2.34	.01	
	A-A vs. A-O by SAAD + INV INT combined vs. EMB + PASS combined	Planned Comparison	8.13	.01	SAAD + INV INT combined > EMB + PASS combined in A-O > A-A Sem. Acc. > Synt. Acc. for EMB + PASS combined A-A > A-O Sem. Acc. > Synt. Acc for context
	POSS vs. LOC by SAAD + INV INT combined vs. EMB + PASS combined	Planned Comparison	2.97	.05	Negative Scores for POSS > LOC in SAAD + INV INT combined Synt. Acc. > Sem. Acc. Negative scores for POSS > LOC in EMB + PASS combined Sem. Acc. > Synt. Acc.
H_3: Syntax		MANOVA	7.35	.01	Supports H_3
	EMB vs. PASS	Planned Comparison	16.78	.01	PASS > EMB Synt. Acc. > Sem. Acc.
	SAAD + INV INT combined vs. EMB + PASS combined	Planned Comparison	6.50	.01	SAAD + INV INT combined > EMB + PASS combined Synt. Acc. > Sem. Acc.
H_4: Semantics		MANOVA	17.19	.01	Supports H_4
	A-A vs. A-O	Planned Comparison	7.33	.01	A-O > A-A Synt. Acc. > Sem. Acc.
	POSS vs. LOC	Planned Comparison	48.58	.01	LOC > POSS Sem. Acc. > Synt. Acc.

Summary of Results

Major Hypotheses	Significant Subhypotheses	Test	F	Significance	Findings
	A-A + A-O combined vs. POSS + LOC combined	Planned Comparison	3.14	.05	POSS + LOC combined > A-A + A-O combined Synt. Acc. > Sem. Acc.
H_5: Semantics by Syntax		MANOVA	4.56	.01	Supports H_5
	POSS vs. LOC by SAAD vs. INV INT	Planned Comparison	3.67	.03	LOC > POSS for SAAD > INV INT Sem. Acc. > Synt. Acc.
	A-A + A-O combined vs. POSS + LOC combined by SAAD vs. INV INT	Planned Comparison	8.08	.01	POSS + LOC > A-A + A-O in INV INT for both Acc. scores
	A-A vs. A-O by EMB vs. PASS	Planned Comparison	4.20	.02	A-O > A-A in EMB Synt. Acc. > Sem. Acc. A-A in EMB. Very low Synt. Acc. score Higher Acc. scores in PASS
	A-A + A-O combined vs. POSS + LOC combined by EMB vs. PASS	Planned Comparison	4.10	.02	A-A + A-O combined > POSS + LOC combined Sem. Acc. > Synt. Acc. in PASS Very low Synt. Acc. score in EMB. Very low Sem. Acc. scores for POSS in EMB
	A-A vs. A-O by SAAD + INV INT combined vs. EMB + PASS combined	Planned Comparison	4.93	.008	A-O > A-A in SAAD + INV INT combined for both Acc. scores A-O > A-A in EMB + PASS combined. Synt. Acc. > Sem. Acc.

Summary of Results

Major Hypotheses	Significant Subhypotheses	Test	F	Significance	Findings
	A-A + A-O combined vs. POSS + LOC combined by SAAD + INV INT combined vs. EMB + PASS combined	Planned Compari-son	11.56	.01	POSS + LOC combined > A-A + A-O combined in SAAD + INV INT combined Synt. Acc. > Sem. Acc. A-A + A-O combined > POSS + LOC combined in EMB + PASS combined Both Acc. Scores were higher.

CHAPTER 7

DISCUSSION AND IMPLICATIONS

Authorities agree that language deficit is one of the most significant criteria in the diagnosis of early infantile "autism." Two positions are evident in the literature in regard to the basis for this deficit. One claims that deviant language development is responsible, the other claims grossly delayed language development. But to what extent are the results of these previous studies reflective of the research methodology rather than of cognitive strategies inherent in the verbal performance of echolalic "autistic" children? The two conflicting views on "autistic" language seem to be associated with studies of two contrasting types. By focusing on behavioral pathology rather than on linguistic features, clinically-based studies have concluded that deviant language development is responsible for "autism" in these children. On the other hand, few linguistically-based studies have concluded that a gross developmental delay results in language impairment. However, since these latter researchers have studied syntactic aspects of grammatical performance and have not yet explored semantic aspects of language behavior, this conclusion seems premature. Neither of the two positions is satisfactory without first exploring the semantic aspect of language.

The present study attempted to investigate the possible semantic influences underlying the echolalic "autistic" children's imitative

performance. In testing the basic debate as to whether echolalic "autistic" children are using language forms which conform to normal language developmental forms (quantitative differences) or whether echolalic "autistic" children are utilizing different forms (qualitative differences) in the language acquisition process, the following main research questions were addressed:

1. Is there a differential effect of Mean Length of Utterance (MLU) on echolalic "autistic" children's ability to imitate?
2. Is there a differential effect of presence or absence of external contextual manipulation on echolalic "autistic" children's ability to imitate?
3. Is there a differential effect of syntactic constructions on echolalic "autistic" children's ability to imitate?
4. Is there a differential effect of semantic relations on echolalic "autistic" children's ability to imitate?
5. Is there a semantic-syntactic interaction effect on echolalic "autistic" children's ability to imitate?

The results of the present study will be discussed in terms of the research questions posed above.

Mean Length of Utterance (MLU) Differences

In regard to the overall level of language development, it was found that the predicted main effect of MLU on more accurate imitative performance failed to reach significance. The data did not reveal any significant difference between Stage I, Stage II, and Stage III children in their ability to maintain either Semantic Relations or Syntactic Constructions.

The only effect with the Stage factor which reached significance was the interaction between Context/Non-Context, the Syntactic Constructions and Language Stage, which compares imitative accuracy under Context/Non-Context conditions for different types of Syntactic Constructions at various Language Stages. The difference found was due to the Stage III groups. This effect will be discussed in more detail later in regard to the differential effectiveness of the presence or absence of external contextual manipulation condition.

The lack of difference between the Language Stage levels raises the question as to whether MLU is the appropriate criterion for assessing increase in language development for an investigation dealing with "autistic" children.

For many years MLU has been used as an index of language knowledge and has been found to relate to many aspects of linguistic performance. For example, in several recent studies (Carrow, 1974; Lehner, 1976) MLU has been found to predict imitative performance. It is surprising then, that this study did not reveal such a result. Four major possibilities may account for this:

1. Research with normal and language-delayed children has shown that these children reflect their current language knowledge in imitative performance. It may be concluded that echolalic "autistic" children respond to elicited imitation tasks with a different strategy. This issue will be discussed further subsequently, after presenting the rest of the findings.

2. The language samples used in this study may not have been representative of the language knowledge of these children. Following the practice of researchers like Lee (1974), fifty consecutive nonimitative utterances were elicited from each child in a free-play interaction with the teacher or speech therapist, using a variety of toys, children's books and puppets to stimulate language. Collecting larger samples of "spontaneous" speech production from children who are notorious for their lack of "spontaneous," communicative speech would have been an overwhelming task. Fifty consecutive utterances are considered efficient because "it is a reasonable and realistic number to expect from even an untalkative language delayed child" (Lee, 1974, p. 66). However, there is some research indicating that a larger corpus may be necessary to get a reliable measure of typical sentences from linguistically disordered children with MLUs over 3.0 (Tyack, 1973). It may be concluded that the short samples used in the present study may not have been adequate.

3. The other reason for unrepresentative samples may be seen in the fact that echolalic "autistic" children are often reticent and use only the minimal amount of language necessary in context. In so far as this is true, MLU simply underestimates these children's language knowledge. Such underestimation would make the Stage I MLUs particularly unrepresentative, since two different types of children could fall within this MLU range: (a) those who use one- or two-word sentences but know more; and (b) those who use one- or two-word sentences and could not say more. This "floor" effect results because it is obviously impossible to say less than one word. In other words, some of the Stage I children in this study actually knew more about language than their Stage I MLU suggests.

4. Finally, it is possible that the usual MLU counting conventions simply overestimated the "autistic" child's language knowledge. As mentioned in Chapter 1, there is growing evidence of two early acquisition strategies. Some children seem to build sentences analytically with lexical building blocks that are equivalent to adult words. Other children approach language more synthetically. Their earliest linguistic units are gestalt forms which on the surface appear to be adult phrases, but actually function for the child as giant words. For any child in this latter group the usual MLU counting convention will overestimate language knowledge, because these unanalyzed phrases look like adult morphemes and are counted as such.

This problem may be particularly acute in "autistic" language. Baltaxe and Simmons (1976) also suggest that for some "autistic" children this synthetic strategy is carried to great extremes even with full sentences. In other words, some of the Stage II and particularly Stage III children in this study may have known no more about language than the Stage I children.

In summary, any one of these possibilities would account for the lack of a Stage effect. But in the later section of this discussion there will be evidence which counters the first possibility, so that it is likely that the remaining possibilities--2, 3, and 4--have contributed to the lack of Stage effect in the present data.

Context Versus Non-Context Differences

In regard to the argument whether external contextual manipulation facilitates performance in an elicited imitation task by providing

additional information for the echolalic "autistic" children, the data revealed significant results for the main effect and also for the following interactions: Context by Syntax, Context by Semantics, Context by Syntax by Stage and Context by Semantics by Syntax.

The significant difference found for the Context/Non-Context presentation condition supports Hypothesis 2 and indicates that echolalic "autistic" children utilize non-verbal, contextual information in the language imitative performance. As might be expected, this holds true for the Semantic Accuracy and not for the Syntactic Accuracy. In general, when the children were able to view the referent event, these "autistic" children were more likely to understand the meaning of the sentence and reproduce its semantic relations. The cue to meaning had little effect on their success in syntactic analysis.

The finding that the presence of contextual manipulation facilitated more accurate imitative performance for echolalic "autistic" children seems plausible in light of the work by other researchers such as Bates, 1976; Clark, 1976; Bloom, 1974; Slobin and Welsh, 1973; and Schlesinger, 1971. These studies indicated the important role of context in the processing of sentence meaning.

Differences in the degree to which the meaning of a sentence could be objectively portrayed seemed to account for the significant interactions between Context and Semantic Relations. Semantic Accuracy scores in the most action-oriented sentences, i.e., those which involved Agent-Action and Action-Object relations, were facilitated more by the presence of Context than scores in the essentially stative sentences, i.e., those which included possessive and locative relations.

The presence of an interpretible physical context, however, did not keep the children from attending to the linguistic input. If they were listenting to sentences which were syntactically different, particularly the Embedded constructions, the children's Semantic Accuracy scores were impaired by witnessing the concrete event (Context by Syntax). It was as though they were confused by the discrepancy between the simple event they saw and the complex linguistic stimulus.

A combination of these two parameters, i.e., ease of objectification and syntactic complexity, seems to explain the three-way interaction between Context by Semantics by Syntax. Performance on the Possessive by Embedded sentences was negatively effected by the presence of Context. These sentences were syntactically different and least objectively portrayable.

The surprising finding of a significant difference between Context/ Non-Context by Syntax by Stage was mainly due to the fact that the higher functioning children did not repeat the stimlus sentences for Inversion Interrogative construction but rather answered the yes/no questions. Most of these children had language training in which they were taught to answer yes/no questions. They could not be encouraged to repeat the sentences and were very much confused by the task. The contextual manipulation even further biased the children to respond with an answer rather than to repeat the stimulus sentence.

In summary, on the basis of the result for the main effect of presence or absence of contextual manipulation, it is reasonable to conclude that echolalic "autistic" children utilize nonverbal, contextual informa-

tion in their imitative language performance and that Context primarily facilitates the preservation of the relational meanings.

Syntactic Construction Differences

It was hypothesized that early evolving syntactic constructions like Simple Active Affirmative Declarative (SAAD) and Inversion Interrogative (INV INT) forms will be more readily preserved in the children's elicited imitative performance. This hypothesis assumes that sentence forms which are most familiar will be easiest to imitate. Research with normal children has demonstrated the effect of relative syntactic complexity. Comparable results with "autistic" children would indicate that they process language input in a similar fashion.

Tests of differential effectiveness of the four Syntactical Constructions, however, yielded a surprising result. Of all four Syntactic Constructions, the Passive form was the one most frequently maintained. At first glance this finding seems to oppose the normal language acquisition process. A closer look at the exact nature of the children's "successful" imitations, however, suggests an explanation for this unexpected result. Two-thirds of the syntactically correct responses to passive sentences were truncated, i.e., omitted surface mention of the agent/subject. For example, children who would respond to the stimulus sentence: "The boy was hit by the girl," tended to repeat by saying: "Boy was hit." These responses exceeded the 25% which were expected based on the nature of the input. Slobin (1971) reports that for adults it is equally difficult to process both truncated passives and simple active sentences, while they face more difficulty with full passives.

Moreover, 70 to 84% of passive sentences used in spoken English contain no mention of the active subject (Slobin, 1971), And as noted by Slobin (1971), children acquire truncated versions of passive sentences much earlier than the full version. The anticipated difficulty of the passive sentences was based on the late appearance of the full passives, not the early use of truncated forms.

The difference between Passive and Simple Active Affirmative Declarative was again related to the use of truncated passives. Both for PASS and SAAD sentences children tended to omit the agent/subject and to maintain the action-patient relation. In the case of passives that led to legitimate truncation, usage was scored as syntactically correct. In the case of SAAD agent/subject sentences, omission was considered ungrammatical and scored as incorrect. It was an interesting observation, then, that the children were consistently dropping the agent/subject constitutent which in normal conversation would be considered least important. Given the order of difficulty: PASS < SAAD < EMB < INV INT, the significant contrast between SAAD/INV INT and PASS/EMB reflects that the difference was primarily due to the performance on PASS and SAAD.

The relative difficulty of the Embedded constructions also revealed the children's attention to meaning of linguistic structure. It may be recalled that these sentences all involved relative clauses and that most of them modified sentence subjects. The phenomenon accounting for this difference was the fact that children were more likely to maintain the relative clause in A-O sentences than in A-A. An example for A-A is: "The girl who is pretty is running". An example for A-O is: "Eat the cake which has white frosting". The interesting observation was that

the relative clause in A-A condition modified the subject, while in A-O condition the relative clause modified the grammatical object. As discussed by Limber (1973), children learn first the object relative clauses. Slobin and Welsh (1973) also cited that their subject had difficulties maintaining the subject relative clauses.

In interpreting a finding like the above, it is likely that the interruption in subject relative clauses created more difficulties and maybe even confusions in "autistic" children, while the object relative clauses did not cause interruptions. This finding is also supported by psycholinguistic research, which has reported that processing of the subject relative clauses results in interruption while the processing of object relative clauses does not.

Finally, the "difficulty" of Inversion Interrogative construction reflects conversational principles. Again, children at Stage III particularly reacted to the INV INT questions with a large number of yes/no responses. Such "error" responses actually indicate the correct comprehension of the syntactic structure under investigation. These children "forgot" that they were not supposed to converse. It should also be noted that many of these children had varied extensive training in answering yes/no questions appropriately.

In summary, the effect of Syntactic Construction on echolalic "autistic" children suggests that by treating these sentences as real language, they reveal their knowledge of the principles of language use. Also, the children appeared to be processing for meaning and not merely reflecting rote memory capacities, since in the case of PASS, the dropped

element is at the end of the sentence and in the case of SAAD it is at the beginning. On the basis of the present result, it may be concluded that the effect of Syntactic Constructions on these children seems to suggest that "autistic" children attend to meaning and that they utilize their knowledge of appropriate language usage.

Semantic Relations Differences

It was anticipated that the meaning of the sentence would affect the children's imitative language performance. Specifically, performance on sentences which include Agent-Action (A-A) and Action-Object (A-O) relations was expected to be more accurate than performance on sentences including Possessive (POSS) and Locative (LOC) relations. Again, it was presumed that the more familiar relations would facilitate imitative performance. Researchers like Brown (1973), Schlesinger (1971), and Bloom et al. (1974) had reported that A-A and A-O relations occurred more frequently in young children's spontaneous speech. There is some disagreement as to the point in development at which children include the agent in the surface sentence (Leonard, 1976). There seems to be enough agreement that action-predicates are expressed prior to statives (Bloom et al., 1974; Leonard, 1976). In this study, it was the A-O and A-A sentences which carried the action meanings. The analysis of data revealed, therefore, that the A-O relation was more frequently maintained than A-A relation. This finding seems to support those researchers who have found that agent appears later than object in young children's utterances. Syntactic scores for A-A utterances were lower because children omitted the agent/subject. As argued earlier, this

constituent is most likely to be redundant in context, which is presumably the reason it appears "late" despite the early use of action/predicates. This effect was strong enough that it even made the A-A and A-O syntactically "less accurate" than the POSS and LOC statives (see contrast A-A and A-O combined versus POSS and LOC combined).

The final significant semantic effect involved the comparison between the POSS and LOC relations. Looking at the interaction, the locative relation was more frequently maintained than the possessive relation. This finding points to the role of propositional complexity in imitation. In order to receive a correct score on the possessive relation, an extra modification proposition was needed (e.g., "lady purse open/the lady's brown purse is open"). In case of the locative relation only, the repetition of object and location was necessary. Researchers like Hass and Wepman (1974), and Antinucci (1973), pointed out that sentences with fewer propositions occur earlier and they are therefore easier to maintain. The children in the present study were more likely to repeat agent and location (e.g., "boat on lake/the big boat is on the lake") than add an extra modifier to the agent (e.g., "boy truck broken/ the boy's dump truck is broken").

In summary, the effect of Semantic Relations on echolalic "autistic" children in an elicited imitation task reveals a slight inconsistency in the developmental order of acquisition of Semantic Relations. The order of difficulty, LOC < A-O < A-A < POSS, reflects that the difference was primarily due to the performance on the locative relation.

Semantic-Syntactic Complexity Differences

It was hypothesized that if the syntactic construction is beyond the linguistic capacity of echolalic "autistic" children, they will nevertheless retrieve the underlying meaning of the stimulus sentence (semantic relation). It also was assumed that when the children are presented with sentences which include the most familiar semantic relations in early evolving syntactic constructions, they will be capable of processing both the semantic relations and the syntactic forms. In contrast, when the children are presented with sentences including the familiar semantic relation which they are capable of processing--but the syntactic form is beyond their current level of linguistic capacity--they will skip the syntactic form and turn their attention to the sentence meaning (semantic relation).

The analysis of data in regard to the semantic-syntactic complexity revealed more complicated differences than expected. Given the order of difficulty for the syntactic constructions, PASS < SAAD < EMB < INV INT, the analysis demonstrated that the Embedded construction was really the most complex syntactic form which was beyond the children's linguistic capacity. There was an apparent tendency in processing this complex syntactic form. When the children were presented with the Embedded forms, they tended to disregard the syntax and directed their attention to the semantic relation. (See all planned contrasts for H_5 involving the EMB construction.)

Given the order of difficulty for the semantic relation factor, LOC < A-O < A-A < POSS, the data analysis revealed that the possessive relation was the most complex semantic relation which was beyond the

children's linguistic capacity. Confronted with sentences involving possessive relation, the children tended to turn their attention also to the semantic variable. It was expected that with greater cumulative complexity, children would perform more successfully on the semantic accuracy variable. Yet, the analysis of data revealed that correct performance decreased for both dependent variables. (See all planned contrasts for H_5 involving POSS relation.) It also was apparent that when the children were confronted with syntactic constructions which they were supposed to be capable of processing, as in the case of SAAD construction, their inability to maintain the syntax diminished.

In regard to the effect of semantic-syntactic complexity, the data revealed that syntax was a significant factor in preservation of semantic relations. However, the composite results did not point to a precise preference for semantics over syntax. The findings somewhat counteract Brown's (1973) view of cumulative semantic-syntactic complexity which determines acquisition order. The results, however, may suggest an alternate language processing strategy employed by echolalic "autistic" children responding to an elicited imitation task. In situations where the children are confronted with sentences which include familiar semantic relations in early occcurring syntactic forms which they are supposed to process, they turn their attention to the sentence meaning. They stop to process the syntax form. In situations where the children are presented with stimulus sentences which include familiar semantic relations which they are capable of processing, but in which the syntactic form is beyond their linguistic capacity, they are confused by the

linguistic input and only repeat the last words of the sentences due to their lack of comprehension of syntactic form.

In summary, the effect of semantic-syntactic complexity on echolalic "autistic" children indicated that the children process language for meaning, provided that the syntactical constructions are not beyond their productive linguistic capacity.

This chapter has discussed the results of the present investigation in relation to the five research questions derived from the theoretical framework of the role of elicited imitation to determine echolalic "autistic" children's language knowledge. It is concluded that echolalic "autistic" children do process language for meaning according to their current level of linguistic functioning. When environmental cues (contextual manipulation) are provided, processing of language results in more accurate performance, a finding which might point to a new direction in future language training for these children.

The implications of the present study in relation to research theory and language training are presented in the following section.

Implication for Research, Theory and Language Training

Research. As discussed earlier, researchers in the area of child language have expressed their opinions toward elicited imitation as an assessment device to determine the level of children's language functioning. The opinions have been influenced by theoretical disputes which range from inadequacy, that imitation does not operate through linguistic capacity (Fraser, Brown, & Bellugi, 1963), to the view of a reliable indicator for children's language knowledge (Bloom, 1974; Carrow, 1974;

Clark, 1976; Menyuk, 1963; Slobin & Welsh, 1973). The results of the present study lend support to the latter group of researchers. The children's knowledge of language was revealed through the systematic use of elicited imitation of selected sentences which exceeded their short-term memory. The results suggest two major areas for further research:

1. In designing an elicited imitation task, stimulus sentences have to be improved. For example, in this study yes/no stimulus questions were used. This question form confused most of the children participating in the investigation. Future imitation experiments might either exclude the inversion interrogative construction, or use different testing and scoring procedures.

It was found in the present study that there was an interesting difference in the nature of the nonimitative utterances and the imitation performance. Therefore, a comparison between nonimitative utterances and the imitation performance might be investigated. This suggests that a comparison of the two verbal performance types may offer valuable information for fuller investigation.

In addition, it is suggested that the number of children might be increased in future studies. Children of more advanced levels of linguistic maturity should be included to determine whether the trend revealed in the present study would continue.

2. In regard to the use of Mean Length of Utterance (MLU) as an index for increase of language knowledge for "autistic" children, it is suggested that the number of language samples might be increased to

obtain more representative language samples. The language samples should be collected in home environments or across different activities. Enlarged language samples in a more natural atmosphere might provide more carefully selected nonimitative and more typical utterances from the children.

Considering the limitation of the general counting convention of MLUs, it is suggested that the use of MLU in future research with these children be reevaluated. The scores of the Peabody Picture Vocabulary Test (PPVT) yielded a positive correlation with MLU (r_{xy} = .44) in the present study. There was 20% common variance between the PPVT scores and MLU at a .05 level of significance. This suggests that the use of the PPVT may be a reliable measure for language knowledge in future research.

Theory. As discussed earlier, clinically based research has considered the presence of echolalia in "autistic" children as deviant and irrelevant for language development. Although there is clear evidence that normal children at about nine or ten months of age exhibit echolalia as a part of their normal language development pattern (Berry, 1947, 1956), the clinical interpretation of deviant language development still remains.

The results of the present study reveal that echolalic language behavior is indicative of language knowledge, and do not support the claim of previous clinical research.

On the other hand, the linguistically based research, which claims that grossly delayed language development is responsible for language impairment in children, could not be denied. The level of language

knowledge evidenced by the children in the present sample may be commensurate with Lee's normative data for approximately four-year olds. This finding concretely represents language delay but cannot be associated with qualitative deviance of language development. Although the study was not designed for comparing "autistic" children with other language-delayed children, the findings do not identify a language behavior unique to the syndrome of early infantile "autism".

Very recently, it has been claimed that cognitive deficits specific to language may preclude the development of meaningful language (Hingtgen & Bryson, 1972). Yet the present data reveal that these children use meaning as a clue to language (semantic relation). The delay and the difficulties in processing certain semantic relations, particularly the possessive relation, point to their conceptual knowledge about the environment. Slobin (1973) has postulated three classes of prerequisites for the acquisition of language. The first prerequisite is the ability to perceive and extract the underlying semantics of utterances. As stated by Moerk (1976):

> nearly from the beginning of his life on, the infant has been actively involved in manipulating objects and persons in his environment. He is, therefore, profoundly aware of his action potential and his effects upon objects. He himself has also been manipulated frequently during the care-giving procedures and has observed other persons manipulating objects or moving in space and performing acts in temporal sequence. ... Since he becomes increasingly inclined and nearly forced to convey some of these structured conceptualization, he is again eager to incorporate some of the means which he finds pre-formed in the adult language system that surrounds him continuously (Moerk, 1976, p. 147).

The above structured conceptualizations are derived from the early experiences, and they reflect essentially the structure of the semantic realization. It might cause later language impairment if children are lacking these early experiences. This leads to the conclusion that the children's language impairment may stem from a limitation in preverbal conceptualization rather than from an inability to translate knowledge into the linguistic code.

Language training. After teaching echolalic "autistic" children for more than five years, it was the researcher's concern that harm is caused by extinguishing echolalic speech behavior. The results of the present study confirmed that echolalic behavior is useful and can be systematically utilized through imitation tasks. Furthermore, the findings imply three directions which may be considered in designing language training programs:

1. Accepted principles of language development for normally developing children might be profitably applied to "autistic" children. In essence, starting with linguistic tasks which the child is able to perform and building up from there with developmental norms in mind may be an important language training strategy. As the present results demonstrate, "autistic" children seek meaning as a clue to language. Although, as Clark (1976) claims, children often copy what they fail to comprehend fully, imitation plays a much more positive role in the acquisition of syntax. Making adult language forms available to a child helps him recognize these forms more readily. When the adults use them the child is able to assimilate their functions gradually

through use (Clark, 1976, p. 351). Utilizing elicited imitation systematically may provide valuable support in learning new conceptual relations.

2. The present findings suggest that the presence of non-linguistic contextual manipulation helps in the conceptual realization process. This implies that children should be taught in the contexts in which concepts naturally occur. The child who is characterized by lack of comprehension is required to sit passively and absorb the information presented by the teacher/speech therapist. Instead, the child might benefit by being actively involved in the realization process. Physical acting out of the structural concept in a somewhat natural communicative atmosphere seems essential for understanding the concept and for later usage.

3. Emphasizing the importance of the communicative atmosphere in teaching "autistic" children follows recently posited linguistic approaches (Halliday, 1975). This orientation considers verbal output as appropriate at levels of phonology, syntax, and semantics, taking into account that language is a "system of systems" equal to more than the sum of its parts. The finding that "autistic" children systematically use semantic relations at rates commensurate with their syntactic development supports the suggestion of a communication-oriented approach to language training programs for these children. This position also questions that any one facet of the language system can be fully evaluated if viewed in isolation. A valid language assessment depends on establishing a relationship between all other linguistic elements coexisting within the same language system. Hence, the improvement of

any facet of a child's language system will most probably have an impact on all other facets of the system.

Conclusions

The primary symptom attributed to all children who participated in the present study was their language impairment which seemed to stem from limitations in preverbal conceptualization. Although their language knowledge was not comparable to nonimpaired children of the same age, the "autistic" children did not evidence strategies which would justify a decision about their being deviant. In contrast, they approached language in the very natural fashion of seeking meaning.

Language behavior was assessed by some authorities as the most important diagnostic criterion for specifying and identifying the syndrome of early infantile "autism" as a clinically separate entity. Hence, the question remains, does an "autistic" syndrome exist? The results of the present study did not identify a language characteristic specific and unique to this syndrome.

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Appendix A

Diagnostic Criteria

Diagnostic Criteria

Child: Date scored:

Simmons and Tymchuk categories (1973) equivalent to Rutter categories (R_1) - (R_7) (1974)	Yes	?	No
1. Impairment of interpersonal relationships characterized by aloofness, decreased physical contact, and lack of eye contact.			
(R_1) Profound and general failure to develop social relationships.			
2. Deficits in social behavior seen in severe limitations in cooperative play, toy play, and self-care skills.			
(R_7) Delayed bowel control.			
3. Stereotyped activities including self-stimulatory behavior, various kinds of repetitions, and preoccupations with sameness.			
(R_3) Ritualistic or compulsive phenomena.			
(R_4) Stereotyped repetitive movements, especially hand and finger mannerisms.			
(R_6) Self-injury.			
4. Impairment of intellect manifested by concreteness of thought, school performance deficits, and difficulties with judgment and abstract thinking			
(R_5) Short attention span.			
5. Disturbances in speech and language seen in various forms such as mutism, echolalic speech, delayed development, and a variety of other ideosyncrasies in word usage, speech modulation, and content.			
(R_2) Language retardation with impaired comprehension, echolalia, and pronominal reversal.			

Diagnostic Criteria

Child: Date scored:

Simmons and Tymchuk categories (1973) equivalent to Rutter categories (R_1) - (R_7) (1974).	Yes	?	No
6. Onset prior to age of 30 months.			
7. EEG			
Totals:			

Geographic Locations of Research

The research was conducted from Indiana University, Bloomington. The test sites for the research were in four different schools especially designed for "autistic" children in different parts of the United States:

1. Midwest
2. Southeast
3. Northeast
4. East

Appendix B

Sentence Stimuli

Sentence Imitation Stimuli

Context Elicited Imitation

I. SAAD

A. Agent-Action

1. The tired man is sleeping very soundly.

2. The pretty little girl is running rapidly.

B. Action-Object

1. Throw the big ball very quickly.

2. Drink the cold orange juice right now.

C. Possessive Relation

1. Mommy's (pink)* china cup is very pretty.

2. The doll's pretty dress is very dirty.

D. Locative Relation

1. The (green) hat is on the (blue) chair.

2. The pretty flower is in the vase.

*Colors of the toys were not the same in every school setting.

II. Inversion Interrogative

A. Agent-Action

1. Is the big motor boat sinking fast?

2. Is the sad baby doll crying loudly?

B. Action-Object

1. Is hitting a little girl a nice thing?

2. Is riding a horse a lot of fun?

C. Possessive

1. Is the mean giant's puppy happy?

2. Is the old lady's (white) purse open?

D. Locative

1. Is the toothbrush in the bathroom?

2. Is the dump truck under the chair?

III. Embedded

A. Agent-Action

1. The man who is tired is sleeping.

2. The boy that I see is running.

B. Action-Object

1. Hit the ball which is (red) and (blue).

2. Walk the dog that has the long leash.

C. Possessive Relation

1. The dog's fur which is (brown) is pretty.

2. The boy's truck which is broken is (red).

D. Locative Relation

1. The boat which is big is on the lake.

2. The girl who is pretty is in the chair.

IV. Passive**

A. Agent-Action

1. The boy was hit by the girl.

2. The baby was kissed by the mother.

B. Action-Object

1. The dress was worn by the girl.

2. The house was built by the man.

**Passive was acted out by the child.

C. Possessive Relation

1. The girl's dress was washed by the mother.

2. The father's hat was blown away by the wind.

D. Locative Relation

1. The flower was put in the vase.

2. The block was dropped on the floor.

Non-Context Elicited Imitation

I. SAAD

A. Agent-Action

1. The happy brown dog is jumping up and down.

2. The funny clown is laughing very happily.

B. Action-Object

1. Hold the littly baby doll tightly.

2. Push the big dump truck slowly.

C. Posessive Relation

1. The brown dog's food dish is empty.

2. The little boy's dump truck is broken.

D. Locative Relation

1. The story book is under the kitchen table.

2. The evening newspaper is beside the door.

II. Inversion Interrogative

A. Agent-Action

1. Is the little blue bird singing happily?

2. Is the furry black cat sleeping soundly?

B. Action-Object

1. Is drinking cold milk good for you?

2. Is pounding a nail a lot of fun?

C. Possessive Relation

1. Is the little boy's bicycle fixed?

2. Is the black cat's tail furry?

D. Locative Relation

1. Is the banana on the kitchen counter?

2. Is the red crayon beside the paper?

III. Embedded

A. Agent-Action

1. The policeman who is hungry is eating.

2. The girl who is happy is singing.

B. Action-Object

1. Kiss the clown who is very funny.

2. Eat the cake which has white frosting.

C. Posessive Relation

1. The lady's coat which is warm is wool.

2. The baby's bottle which is warm is ready.

D. Locative Relation

1. The book which is mine is under the table.

2. The clown who is funny is beside the horse.

IV. Passive**

A. Agent-Action

1. The policeman was hit by the big truck.

2. The boy was touched by his mother.

B. Action-Object

1. The candy was eaten by the child.

2. The stove was turned on by the mother.

C. Possessive Relation

1. The boy's finger was cut by the knife.

2. The woman's purse was taken by the man.

D. Locative Relation

1. The car was driven into the garage.

2. The boy was kicked in the leg.

Scoring Sheet

NAME: _____ Sex: M F C.A.: MLU:

Group _____ Context Presented: Birth Order:

Non-Context Presented:

	Context		Non-Context	
	SR	Syntax	SR	Syntax
I. SAAD				
A-A	____	____	____	____
A-A	____	____	____	____
A-O	____	____	____	____
A-O	____	____	____	____
POSS	____	____	____	____
POSS	____	____	____	____
LOC	____	____	____	____
LOC	____	____	____	____

Name _____

	Context		Non-Context	
	SR	Syntax	SR	Syntax
II. Interrogative				
A-A	___	___	___	___
A-A	___	___	___	___
A-O	___	___	___	___
A-O	___	___	___	___
POSS	___	___	___	___
POSS	___	___	___	___
LOC	___	___	___	___
LOC	___	___	___	___
III. Embedded				
A-A	___	___	___	___
A-A	___	___	___	___
A-O	___	___	___	___
A-O	___	___	___	___
POSS	___	___	___	___
POSS	___	___	___	___
LOC	___	___	___	___
LOC	___	___	___	___

Name _____

	Context		Non-Context	
	SR	Syntax	SR	Syntax
IV. Passive				
A-A	___	___	___	___
A-A	___	___	___	___
A-O	___	___	___	___
A-O	___	___	___	___
POSS	___	___	___	___
POSS	___	___	___	___
LOC	___	___	___	___
LOC	___	___	___	___

Responses on the Elicited Imitation Task

by a Subject at Language Stage I

Sex: F Chronolgoical Age: 14 years 10 months MLU: 1.72

CONTEXT ELICITED IMITATION

I. SAAD	SR	Syntax
A. Agent-Action		
1. The tired man is sleeping very soundly.		
The tired is sleeping	0	0
2. The pretty little girl is running rapidly.		
running rapidly	0	0
B. Action-Object		
1. Throw the (big) ball very quickly.		
throw small ball	1	1
2. Drink the cold organge juice right now.		
cold organge juice or water	0	0
C. Possessive Relation		
1. Mommy's (pink) china cup is very pretty.		
mommy red china is very pretty	1	1
2. The doll's pretty dress is very dirty.		
doll is very dirty	0	1
D. Locative Relation		
1. The (green) hat is on the (blue) chair.		
the brown hat is red chair	0	0
2. The pretty flower is in the vase.		
pretty flower is in the vase	1	1

		SR	Syntax
II.	**Inversion Interrogative**		
	A. Agent-Action		
	1. Is the big motor boat sinking fast?		
	Is boat sinking fast?	1	1
	2. Is the sad baby doll crying loudly?		
	Is baby crying (ly)	1	1
	B. Action-Object		
	1. Is hitting a little girl a nice thing?		
	Is hitting little girl?	1	1
	2. Is riding a horse a lot of fun?		
	Is riding horse a lot of fun?	1	1
	C. Possessive		
	1. Is the mean giant's (puppy) happy?		
	Is happy mean doggie happy?	0	1
	2. Is the old lady's (white) purse open?		
	Is old lady's purse open?	1	1
	D. Locative		
	1. Is the toothbrush in the bathroom?		
	Is toothbrush in the bathroom	1	1
	2. Is the dump truck under the (bed)?		
	dump truck is under the chair	1	0
III.	**Embedded**		
	A. Agent-Action		
	1. The man who is tired is sleeping.		
	man is tired is sleeping	1	1
	2. The boy that I see is running.		
	boy is see is running	0	0

	SR	Syntax
B. Action-Object		
1. Hit the ball which is red and blue.		
hit the ball red	1	0
2. Walk the dog that has the long leash.		
dog walk dog walk dog leash	0	0
C. Possessive Relation		
1. The dog's fur which is brown is pretty.		
dog fur is brown is pretty	1	1
2. The boy's truck which is broken is (red).		
truck is broken is green	0	1
D. Locative Relation		
1. The boat which is big is on the lake.		
little boat little boat	0	0
2. The girl who is pretty is in the chair.		
in the chair	0	0
IV. Passive*		
A. Agent-Action		
1. The boy was hit by the girl.		
The boy was hit by the girl.	1	1
2. The baby was kissed by the mother.		
The baby is kiss by the mother	1	0

* Passive was acted out by the child

	SR	Syntax
B. Action-Object		
1. The dress was worn by the girl.		
The dress is worn by the girl.	1	1
2. The house was built by the man.		
built by the man	0	0
C. Possessive Relation		
1. The girl's dress was washed by the mother.		
The girl is wash(ed) by the mother	0	1
2. The father's hat was blown away in the wind.		
The hat is blow by the window	0	0
D. Locative Relation		
1. The flower was put in the vase.		
flower is put in the vase	1	1
2. The block was dropped on the floor.		
block is dropped on the floor	1	1

NON-CONTEXT ELICITED IMITATION (1st)

I. SAAD		
A. Agent-Action		
1. The happy brown dog is jumping up and down.		
happy brown jump up and down	0	0
2. The funny clown is laughing very happily.		
funny clown is laughing happily	1	1

	SR	Syntax
B. Action-Object		
1. Hold the little baby doll tightly.		
little baby doll hold tightly	0	1
2, Push the big dump truck slowly.		
push the big dump slowly	0	0
C. Possessive Relation		
1. The brown dog's food dish is empty.		
brown dog is food dish is empty	0	0
2. The little boy's dump truck is broken.		
little dump is broken	0	0
D. Locative Relation		
1. The story book is under the kitchen table.		
The story book is under kitchen table	1	1
2. The evening newspaper is beside the door.		
evenin(g) paper aside the door	1	0
II. Inversion Interrogative		
A. Agent-Action		
1. Is the little blue bird singing happily?		
blue sing happily	0	0
2, Is the furry black cat sleeping soundly?		
Is furry black cat sleeping soundly?	1	1

	SR	Syntax
B. Action-Object		
1. Is drinking cold milk good for you?		
cold milk good for you?	0	0
2. Is pounding a nail a lot of fun?		
Is pounding nail a fun	1	0
C. Possessive Relation		
1. Is the little boy's bicycle fixed?		
bicycle fixed?	0	0
2. Is the black cat's tail furry?		
Is black cat tail furry?	1	1
D. Locative Relation		
1. Is the banana on the kitchen counter?		
kitchen counter	0	0
2. Is the red crayon beside the paper?		
red crayon is on paper	1	0
III. Embedded		
A. Agent-Action		
1. The policeman who is hungry is eating.		
policeman is eating is hungry	1	1
2. The girl who is happy is singing.		
happy singing	0	0

	SR	Syntax
B. Action-Object		
1. Kiss the clown who is very funny.		
Kiss the clown who is very funny.	1	1
2. Eat the cake which has white frosting.		
Eat the cake a white frosting	1	0
C. Possessive Relation		
1. The lady's coat which is warm is wool.		
lady coat is warm is wool	1	1
2. The baby's bottle which is warm is ready.		
baby bottle is warm is ready	1	1
D. Locative Relation		
1. The book which is mine is under the table.		
book is under the table	1	0
2. The clown who is funny is beside the horse.		
The clown is beside the horse	1	0
IV. Passive*		
A. Agent-Action		
1. The policeman was hit by the (big) truck.		
policeman is hit by the little truck	1	1
2. The boy was touched by his mother.		
The boy been touch by	1	0
B. Action-Object.		
1. The candy was eaten by the child.		
candy eaten by child	1	1
2. The stove was turned on by the mother.		
stove is turned on by mother	1	1

	SR	Syntax
C. Possessive Relation		
1. The boy's finger was cut by the knife.		
boy's finger got cut	1	1
2. The woman's purse was stolen by the thief.		
The woman's purse is taken by the man	1	1
D. Locative Relation		
1. The car was driven into the garage.		
car driven into the garage	1	1
2. The boy was kicked in the leg.		
little boy was kicked	0	1

Responses on the Elicited Imitation Task

by a Subject at Language Stage II

Sex: M Chronological Age: 9 years 4 months MLU: 2.21

CONTEXT ELICITED IMITATION

I. SAAD	SR	Syntax
A. Agent-Action		
1. The tired man is sleeping very soundly.		
very soundly	0	0
2. The pretty little girl is running rapidly.		
run rapidly	0	0
B. Action-Object		
1. Throw the big ball very quickly.		
Throw the ball very quickly	1	1
2. Drink the cold orange juice right now.		
cold orange juice right now	0	0
C. Possessive Relation		
1. Mommy's pink china cup is very pretty.		
the cup very pretty	0	0
2. The doll's pretty dress is very dirty.		
very dirty	0	0
D. Locative Relation		
1. The green hat is on the blue chair.		
on the blue chair	0	0
2. The pretty flower is in the vase.		
The pretty flower in the vase.	1	0

II. Inversion Interrogative	SR	Syntax
A. Agent-Action		
1. Is the big motor boat sinking fast?		
yes	0	0
2. Is the sad baby doll crying loudly?		
yes	0	0
B. Action-Object		
1. Is hitting a little girl a nice thing?		
yes	0	0
2. Is riding a horse a lot of fun?		
(say it) lot of fun	0	0
C. Possessive		
1. Is the mean giant's puppy happy?		
yes	0	0
2. Is the old lady's white purse open?		
yes (say it)	0	0
D. Locative		
1. Is the tooth brush in the bathroom?		
yes, toothbrush is, yes	0	0
2. Is the dump truck under the chair?		
(you say it) dump truck chair	0	0
III. Embedded		
A. Agent-Action		
1. The man who is tired is sleeping.		
The man is tired is sleeping	1	1
2. The boy that I see is running.		
is running	0	0

		SR	Syntax
B.	Action-Object		
	1. Hit the ball which is red and blue.		
	Hit the ball is red	1	1
	2. Walk the dog that has the long leash.		
	long leash	0	0
C.	Possessive Relation		
	1. The dog's fur which is brown is pretty.		
	The dog is pretty	0	0
	2. The boy's truck which is broken is red.		
	broken red	0	0
D.	Locative Relation		
	1. The boat which is big is on the lake.		
	on the lake	0	0
	2. The girl who is pretty is in the chair.		
	pretty in the chair	0	0
IV.	Passive*		
A.	Agent-Action		
	1. The boy was hit by the girl.		
	boy hit by the girl	1	1
	2. The baby was kissed by the mother.		
	baby kissed by the mother	1	1
B.	Action-Object		
	1. The dress was worn by the girl.		
	unintelligible	0	0
	2. The house was built by the man.		
	The house is built	1	0

*Passive was acted out by the child

		SR	Syntax
C.	Possessive Relation		
	1. The girl's dress was washed by the mother.		
	The girl's wash by the mother	0	0
	2. The father's hat was blown away by the wind.		
	no response	0	0
D.	Locative Relation		
	1. The flower was put in the vase.		
	flower put in the vase	1	1
	2. The block was dropped on the floor.		
	block is dropped on the floor	1	1

NON-CONTEXT ELICITED IMITATION (1st)

I.	SAAD		
A.	Agent-Action		
	1. The happy brown dog is jumping up and down.		
	unintelligible	0	0
	2. The funny clown is laughing very happily.		
	very happily	0	0
B.	Action-Object		
	1. Hold the little baby doll tightly.		
	tightly	0	0
	2. Push the big dump truck slowly.		
	truck slowly	0	0

	SR	Syntax
C. Possessive Relation		
1. The brown dog's food dish is empty.		
food dish	0	0
2. The little boy's dump truck is broken		
is broken	0	0
D. Locative Relation		
1. The story book is under the kitchen table.		
under the table	0	0
2. The evening newspaper is beside the door.		
by the door	0	0
II. Inversion Interrogative		
A. Agent-Action		
1. Is the little blue bird singing happily?		
yea	0	0
2. Is the furry black cat sleeping soundly?		
(you say it)	0	0
B. Action-Object		
1. Is drinking cold milk good for you?		
yea	0	0
2. Is pounding a nail a lot of fun?		
yea	0	0
C. Possessive Relation		
1. Is the little boy's bicycle fixed?		
yea	0	0
2. Is the black cat's tail furry?		
yea	0	0

		SR	Syntax
D.	Locative Relation		
	1. Is the banana on the kitchen counter?		
	yea, in the kitchen	0	0
	2. Is the red crayon beside the paper?		
	(say it)	0	0
III.	Embedded		
A.	Agent-Action		
	1. The policeman who is hungry is eating.		
	eating	0	0
	2. The girl who is happy is singing.		
	girl singing	1	0
B.	Action-Object		
	1. Kiss the clown who is very funny.		
	Kiss the clown is funny	1	1
	2. Eat the cake which has white frosting.		
	eat white frosting	1	0
C.	Possessive Relation		
	1. The lady's coat which is warm is wool.		
	is wool	0	0
	2. The baby's bottle which is warm is ready.		
	ready	0	0
D.	Locative Relation		
	1. The book which is mine is under the table.		
	under table	0	0
	2. The clown who is funny is beside the horse.		
	by the horse	0	0

IV. Passive*	SR	Syntax
A. Agent-Action		
1. The policeman was hit by the big truck.		
truck	0	0
2. The boy was touched by his mother.		
boy is touched	1	1
B. Action-Object		
1. The candy was eaten by the child.		
candy is eaten	1	1
2. The stove was turned on by the mother.		
no response	0	0
C. Possessive Relation		
1. The boy's finger was cut by the knife.		
boy cut by knife	1	1
2. The woman's purse was taken by the thief.		
taken	0	0
D. Locative Relation		
1. The car was driven into the garage.		
garage	0	0
2. The boy was kicked in the leg.		
kicked in the leg	0	0

*Passive was acted out by the child.

Response on the Elicited Imitation Task

by a Subject at Language Stage III

Sex: M Chronological Age: 7 years 1 month MLU: 3.34

CONTEXT ELICITED IMITATION (1st)

I. SAAD	SR	Syntax
A. Agent-Action		
1. The tired man is sleeping very soundly.		
The tired man sleeping very soundly	1	1
2. The pretty little girl is running rapidly.		
running rapidly	0	0
B. Action-Object		
1. Throw the big ball very quickly.		
Throw the big ball very quickly	1	1
2. Drink the cold orange juice right now.		
Drink the cold orange juice right now	1	1
C. Possessive Relation		
1. Mommy's pink china cup is very pretty.		
Mom cup is very pretty	1	1
2. The doll's pretty dress is very dirty.		
The doll's dress pretty is very dirty	1	0
D. Locative Relation		
1. The (green) hat is on the blue chair.		
The brown hat is in the blue chair	1	1
2. The pretty flower is in the vase.		
The pretty flower is in the vase	1	1

		SR	Syntax
II.	Inversion Interrogative		
	A. Agent-Action		
	1. Is the big motor boat sinking fast?		
	The big motor boat is fast	1	0
	2. Is the sad baby doll crying loudly?		
	The baby doll is crying loudly	1	0
	B. Action-Object		
	1. Is hitting a little girl a nice thing?		
	Is hitting a nice thing?	0	1
	2. Is riding a horse a lot of fun?		
	riding a horse lot of fun?	1	0
	C. Possessive		
	1. Is the mean giant's puppy happy?		
	mean giant's puppy is happy	1	0
	2. Is the old lady's (white) purse open?		
	old lady black purse is open	1	0
	D. Locative		
	1. Is the toothbrush in the bathroom?		
	Is the toothbrush in the bathroom?	1	1
	2. Is the dump truck under the chair?		
	Is the dump truck under the chair?	1	1
III.	Embedded		
	A. Agent-Action		
	1. The man who is tired is sleeping.		
	The man who is tired is sleeping	1	1
	2. The boy that I see is running.		
	The boy I see is running	1	1

		SR	Syntax
B.	Action-Object		
	1. Hit the ball which is red and (blue).		
	Hit the ball which is red and white	1	1
	2. Walk the dog that has the long leash.		
	Walk the dog has the long leash	1	1
C.	Possessive Relation		
	1. The dog's fur which is (brown) is pretty.		
	The fur is dog is grey is furry	0	0
	2. The boy's truck which is broken is red.		
	The boy's truck which is broken is red	1	1
D.	Locative Relation		
	1. The boat which is big is on the lake.		
	which the boat is big is lake	1	0
	2. The girl who is pretty is in the chair.		
	who, girl is pretty in the chair	1	0
IV.	Passive*		
A.	Agent-Action		
	1. The boy was hit by the girl.		
	The boy was hit by the girl	1	1
	2. The baby was kissed by the mother.		
	The baby was kissed by the mother	1	1
B.	Action-Object		
	1. The dress was worn by the girl.		
	The dress was worn by the girl	1	1
	2. The house was built by the man.		
	The house was built by the man	1	1

*Passive was acted out by the child

	SR	Syntax
C. Possessive Relation		
1. The girl's dress was washed by the mother.		
The dress was washed by the mother	0	1
2. The father's hat was blown away by the wind.		
The hat was blown away by the wind	0	1
D. Locative Relation		
1. The flower was put in the vase.		
The flower was put in the vase.	1	1
2. The block was dropped on the floor.		
The block was dropped on the floor	1	1

NON-CONTEXT ELICITED IMITATION

I. SAAD		
A. Agent-Action		
1. The happy brown dog is jumping up and down.		
The happy brown dog is jumping up and down	1	1
2. The funny clown is laughing very happily.		
The clown is very happily	0	0
B. Action-Object		
1. Hold the little baby doll tightly.		
Hold the little baby tightly	1	1
2. Push the big dump truck slowly.		
Push the big dump truck slowly	1	1
C. Possessive Relation		
1. The brown dog's food dish is empty.		
The brown dog food dish is empty	1	1
2. The little boy's dump truck is broken.		
The little boy's dump truck is broken	1	1

		SR	Syntax
D.	Locative Relation		
	1. The story book is under the kitchen table.		
	The story book is under the kitchen table	1	1
	2. The evening newspaper is beside the door.		
	The evening newspaper is beside the door	1	1
II.	Inversion Interrogative		
A.	Agent-Action		
	1. Is the little blue bird singing happily?		
	Is the bird singing happily?	1	1
	2. Is the furry black cat sleeping soundly?		
	furry cat sleeping soundly?	1	0
B.	Action-Object		
	1. Is drinking cold milk good for you?		
	Is drinking cold milk good for you?	1	1
	2. Is pounding a nail a lot of fun?		
	Is pounding nails a lot of fun?	1	1
C.	Possessive Relation		
	1. Is the little boy's bicycle fixed?		
	Is the little boy's bicycle fixed?	1	1
	2. Is the black cat's tail furry?		
	black cat's tail furry?	1	0
D.	Locative Relation		
	1. Is the banana on the kitchen counter?		
	Is the banana in the kitchen counter?	1	1
	2. Is the red crayon beside the paper?		
	the red crayon is beside the paper.	1	0

		SR	Syntax
III.	**Embedded**		
	A. Agent-Action		
	1. The policeman who is hungry is eating.		
	The policeman is hungry is eating	1	1
	2. The girl who is happy is singing.		
	The girl is happy is singing	1	1
	B. Action-Object		
	1. Kiss the clown who is very funny.		
	Kiss the clown who is very funny	1	1
	2. Eat the cake which has white frosting.		
	Eat the cake with its white frosting	1	0
	C. Possessive Relation		
	1. The lady's coat which is warm is wool.		
	Lady's coat is warm is wool	1	1
	2. The baby's bottle which is warm is ready.		
	which bottle is ready	0	0
	D. Locative Relation		
	1. The book which is mine is under the table.		
	which the book is mine is under the table	1	0
	2. The clown who is funny is beside the horse.		
	The clown who is horse is funny	0	0
IV.	**Passive***		
	A. Agent-Action		
	1. The policeman was hit by the big truck.		
	The policeman was hit by the big truck	1	1
	2. The boy was touched by his mother.		
	The boy was touched by his mother	1	1

*Passive was acted out by the child

B. Action-Object	SR	Syntax
1. The candy was eaten by the child.		
The candy was eaten by the child	1	1
2. The stove was turned on by the mother.		
The stove was turned on by the mother	1	1
C. Possessive Relation		
1. The boy's finger was cut by the knife.		
The boy's finger was cut by the knife	1	1
2. The woman's purse was taken by the man.		
The purse was taken by the man	0	1
D. Locative Relation		
1. The car was driven into the garage.		
The car was driven in garage	1	1
2. The boy was kicked in the leg.		
The boy was kicked by the leg	1	1

Appendix C

Additional Information of Statistical Design

Sources of Variation and Error Terms

Fixed Effects Split Plot Factorial 5.244 Multivariate ANOVA

Source of Variation	Error Terms
Between Groups	
H_1: Stage	Children within Stage
Within Groups	
H_2: Context	
Context by Syntax	Context by Syntax by Children within Stage
Context by Semantics	Context by Semantics by Children within Stage
Context by Stage	Context by Children within Stage
Context by Syntax by Stage	Context by Syntax by Children within Stage
Context by Semantics by Syntax	Context by Semantics by Syntax by Children within Stage
Context by Semantics by Stage	Context by Semantics by Children within Stage
Context by Semantics by Syntax by Stage	Context by Semantics by Syntax by Children within Stage
H_3: Syntax	
Syntax by Stage	Syntax by Children within Stage
H_4: Semantics	
Semantics by Stage	Semantics by Children within Stage
H_5: Semantics by Syntax	
Semantics by Syntax by Stage	Semantics by Syntax by Children within Stage

Statistical Design

Context

Stage	Subject	SAAD								INV INT								EMB								PASS							
		A-A		A-O		POSS		LOC		A-A		A-O		POSS		LOC		A-A		A-O		POSS		LOC		A-A		A-O		POSS		LOC	
		SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN
I	1																																
	2																																
	3																																
	4																																
II	5																																
	6																																
	7																																
	8																																
IIIa	9																																
	10																																
	11																																
	12																																
IIIb	13																																
	14																																
	15																																
	16																																
IIIc	17																																
	18																																
	19																																
	20																																

Statistical Design

Non-Context

Stage	Subject	SAAD								INV INT								EMB								PASS							
		A-A		A-O		POSS		LOC		A-A		A-O		POSS		LOC		A-A		A-O		POSS		LOC		A-A		A-O		POSS		LOC	
		SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN	SR	SN
I	1																																
	2																																
	3																																
	4																																
II	5																																
	6																																
	7																																
	8																																
IIIa	9																																
	10																																
	11																																
	12																																
IIIb	13																																
	14																																
	15																																
	16																																
IIIc	17																																
	18																																
	19																																
	20																																